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REPORT

OF THE

National Sesquicentennial Exhibition Commission

ON THE

United States Government Exhibits

AT THE

Sesquicentennial International Exposition

Philadelphia, Pa.

1926

Washington, D. C.

1927

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PLATE 1.—The palace of Machinery, Mines, Metallurgy and Transportation, known as Building No. 5. The majority of the Government exhibits were housed in this building.

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United States. National
sesquicentennial exhibition
Report of the National
sesquicentennial exhibition

RUFUS H. DARBY PRINTING CO.
Washington, D. C.

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INTRODUCTION

The exhibits of the United States Government at the Sesquicentennial International Exposition at Philadelphia were educational in character, illustrative of nearly every branch of the Government service. The excellence of these exhibits was officially recognized by the International Jury of Awards by the presentation of eleven Grand Prizes, thirty-seven Medals of Honor, forty-four Gold Medals, five Silver Medals and two Honorable Mentions.

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CONTENTS

	Page
Introduction	v
National Sesquicentennial Exhibition Commission	viii
Joint Resolution of Congress	ix
Contact Officers	xi
Allocation of Funds and Space	xiii
Guide to Government Exhibits	xiv
Motion Pictures	xvii
Awards to the Government Departments	xviii
Financial Report	xxvii
DESCRIPTION OF THE EXHIBITS	
Agriculture, Department of	215
Commerce, Department of	307
Civil Service Commission	471
Commission of Fine Arts	521
Federal Board for Vocational Education	497
Government Printing Office	13
Interior, Department of	169
Library of Congress	1
Labor, Department of	399
Navy, Department of	143
National Advisory Committee for Aeronautics	505
Post Office Department	73
Panama Canal, The	501
Public Buildings and Public Parks, Office of	533
State, Department of	21
Smithsonian Institution	419
Shipping Board	477
Treasury, Department of the	31
Veterans Bureau	487
War, Department of	61

National Sesquicentennial Exhibition Commission

Members of the Commission

Hon. Frank. B. Kellogg, Secretary of State
Hon. Herbert Hoover, Secretary of Commerce

Staff

George Akerson, Secretary
John M. Denison, Assistant Secretary
William L. Dunlop, Administrative Assistant

Commissioner's Office

Rear Admiral Herman O. Stickney, Commissioner
F. Grant Marsh, Deputy Commissioner
William L. Dunlop, Administrative Assistant
F. Lamson-Scribner, Supervisor of Exhibits
Charles E. Molster, Special Disbursing Officer, Washington, D. C.
Hugh W. Barr, Special Disbursing Officer, Philadelphia, Pa.

(PUBLIC RESOLUTION—No. 7—69th CONGRESS)

(H. J. Res. 153)

Joint Resolution Providing for the Participation of the United States in the Sesquicentennial celebration in the City of Philadelphia, Pennsylvania, and authorizing an appropriation therefor, and for other purposes.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That in order that there may be exhibited at the Sesquicentennial Exhibition to be held in the city of Philadelphia, Pennsylvania, 1926, by the Government of the United States from its executive departments, independent offices, and establishments such articles and materials as illustrate the function and administrative faculty of the Government tending to demonstrate the nature of our institutions and their adaptation to the wants of the people and the progress of our people in the advancement of peace, arts, and industries, there is hereby authorized to be appropriated, out of any money in the Treasury not otherwise appropriated, the sum of $1,186,500 for the selection, purchase, preparation, transportation, arrangement, safekeeping, exhibition, and return of such articles and materials as the National Sesquicentennial Exhibition Commission may decide shall be included in said Government exhibit; rent and use of such space and construction of such buildings or other structures as may be necessary; payment of salaries and actual and necessary traveling expenses of officers and employees of the Government detailed to such commission; for such further participation by the several executive departments and establishments as may be deemed advisable; and such other expenditures as may be deemed necessary by the National Sesquicentennial Exhibition Commission as may be considered proper to commemorate the one hundred and fiftieth anniversary of the birth of the Nation. *Provided,* That not more than $250,000 of the aforesaid sum shall be allocated to the Department of War and not more than $350,000 of said sum be allocated to the Department of the Navy, of which latter sum $250,000 shall be used for making the necessary repairs and improvements at the Philadelphia Navy Yard incident to holding this exposition.

SEC. 2. That for the purpose of further participation by the Government of the United States in such exhibition, there is authorized to be appropriated, out of any money in the Treasury not otherwise appropriated, the further sum of $1,000,000; such sum to be expended by the Sesquicentennial International Exposition, upon the written approval of the National Sesquicentennial Exhibition Commission, exclusively for the construction of four or more buildings for exhibition purposes in connection with Sesquicentennial Exhibition. It is now declared

as the policy of the Government that no deficit which may occur in the expense of the exposition shall be covered by any future appropriation.

SEC. 3. That for the purposes of more effectively carrying out the provisions of this resolution there is hereby created a Commissioner of Sesquicentennial Exposition to be appointed by the National Sesquicentennial Exposition Commission whose duty it shall be to carry out the provisions of this resolution. Said commissioner shall be paid, out of the amount authorized by this resolution, such a salary as the National Sesquicentennial Exhibition Commission shall authorize: *Provided*, That such salary shall not be in excess of $10,000 per annum and that the term of office shall not be extended beyond one year from the date of the approval of this resolution.

Approved February 26, 1926.

Contact Officers

Each branch of the Government participating in the Exposition was requested to appoint a contact officer in order to facilitate the selection, purchase, and preparation of the exhibits.

Following is the list of contact officers:

Department	*Officer*
Library of Congress	A. R. Boyd, Executive Assistant.
Government Printing Office	Alton P. Tisdel, Superintendent of Documents.
Department of State	J. Butler Wright, Assistant Secretary of State E. J. Ayers, Assistant Contact Officer.
Department of the Treasury	F. A. Birgfeld, Chief Clerk. Samuel H. Marks, Assistant Contact Officer.
Department of War	Colonel Joseph W. Beacham, Jr. Brigadier General H. G. Learnard. Major E. H. Hicks, Asst. Contact Officer.
Post Office Department	T. J. Howell, Chief Clerk.
Department of the Navy	Captain P. P. Blackburn.
Department of the Interior	E. K. Burlew, Administrative Assistant.
Department of Agriculture	C. W. Warburton, Director of Extension Work.

Department of Commerce	H. N. Graves, Administrative Assistant to the Secretary.
Department of Labor	S. J. Gompers, Chief Clerk.
Smithsonian Institution	W. deC. Ravenel, Administrative Assistant to the Secretary.
Civil Service Commission	Herbert E. Morgan, Director of Public Information and Recruiting.
U. S. Shipping Board	Samuel Goodacre, Secretary.
U. S. Veterans Bureau	Dr. G. M. Hyland.
Federal Board for Vocational Education	E. J. Aronoff, Secretary and Chief Clerk.
The Panama Canal	A. L. Flint, Chief of Office.
National Advisory Committee for Aeronautics	G. W. Lewis, Executive Secretary.
The Commission of Fine Arts	H. P. Caemmerer, Secretary.
Office of Public Buildings & Public Parks of the National Capital	F. D. Owen.

Allocation of Funds and Space

Department	*Space* (Square feet)	*Funds*
Library of Congress		300.00
Government Printing Office	800	1,000.00
State	2,014	10,500.00
Treasury	2,346	57,000.00
War	Camp	250,000.00
Post Office	18,000**	25,000.00
Navy	Navy Yard	100,000.00
Interior	11,600	60,000.00
Agriculture	20,443	$85,000.00
Commerce	24,596*	104,500.00
Labor	4,442	22,300.00
Smithsonian	9,264	25,000.00
Civil Service	595	5,000.00
Shipping Board	1,530	500.00
Veteran's Bureau	1,156	7,500.00
Federal Board for Vocational Education	765	9,000.00
Panama Canal	1,500	2,000.00
National Advisory Committee for Aeronautics	425	3,100.00
Commission of Fine Arts	391	1,315.00
Public Buildings and Public Parks of the National Capital	2,700	4,000.00

*The Department of Commerce displayed a Mine Rescue Car equipped for service and a Track-Scale Test Car, both of which were located in the west end of Building No. 5.

**Post Office Department also had a Postal Railway Car. Located west end Building No. 5.

Guide to the Government Exhibits

The United States Government Exhibits were so widely separated in the Exposition grounds and in some instances covered such large areas that visitors experienced difficulty in finding the objects in which they were most interested. A "Guide to the Government Exhibits" was printed. The demand for this publication was so large that the first edition of 50,000 copies was soon exhausted. It is interesting to note that requests for this publication are still being received months after the close of the exposition. (Plates 2 and 3).

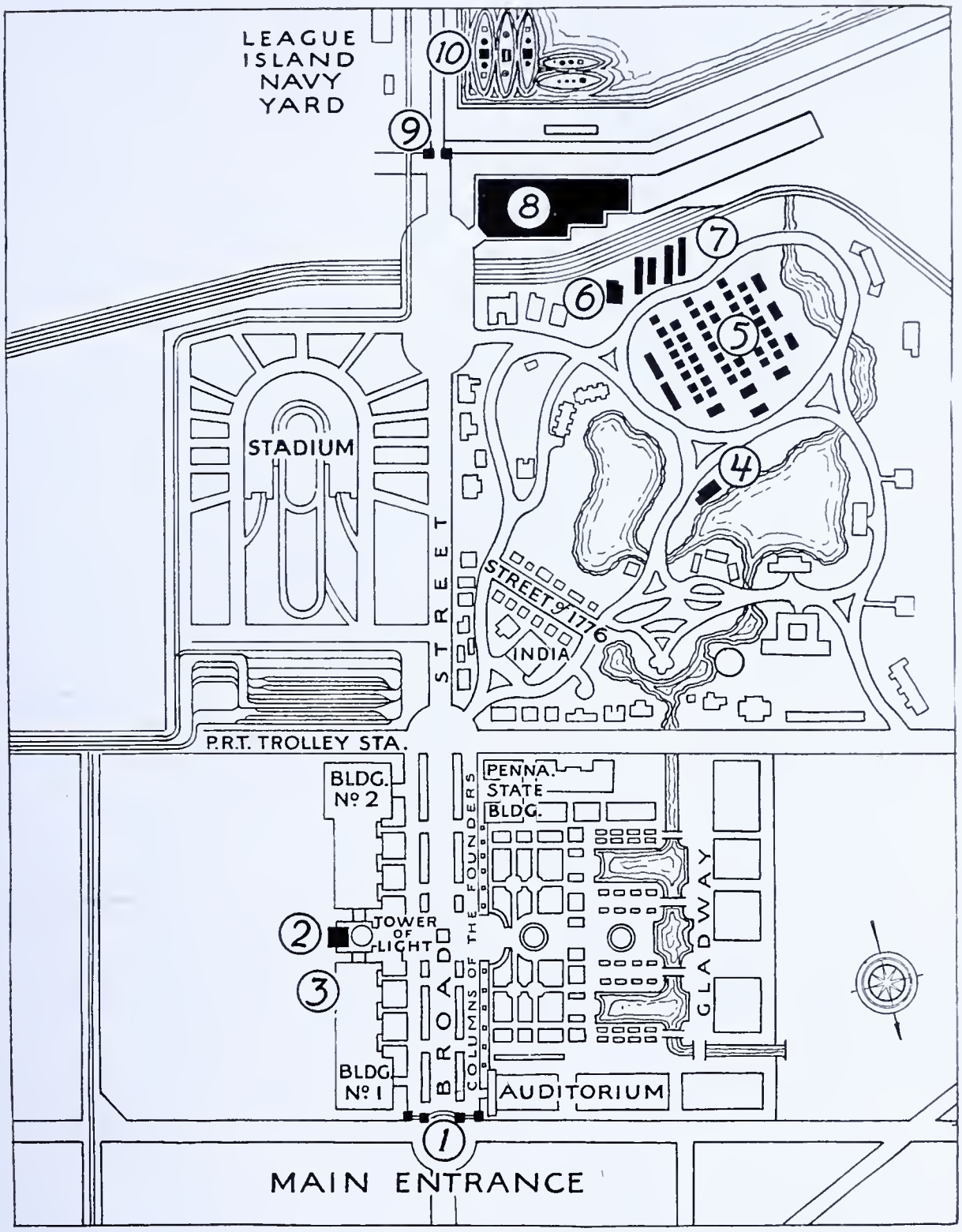

PLATE 2.—Plan of the grounds showing the locations of the United States Government Exhibits. 1, main entrance to grounds; 2, model post office; 3, exhibits from the Virgin Islands: 4, Coast Guard Station; 5, Army Camp, Camp Anthony Wayne; 6, Tun Tavern; 7, Marine Camp, Camp Samuel Nicholas; 8, Building No. 5, in which the majority of U. S. Government Exhibits were displayed; 9, Navy Yard entrance; 10, Vessels at Navy Yard dock.

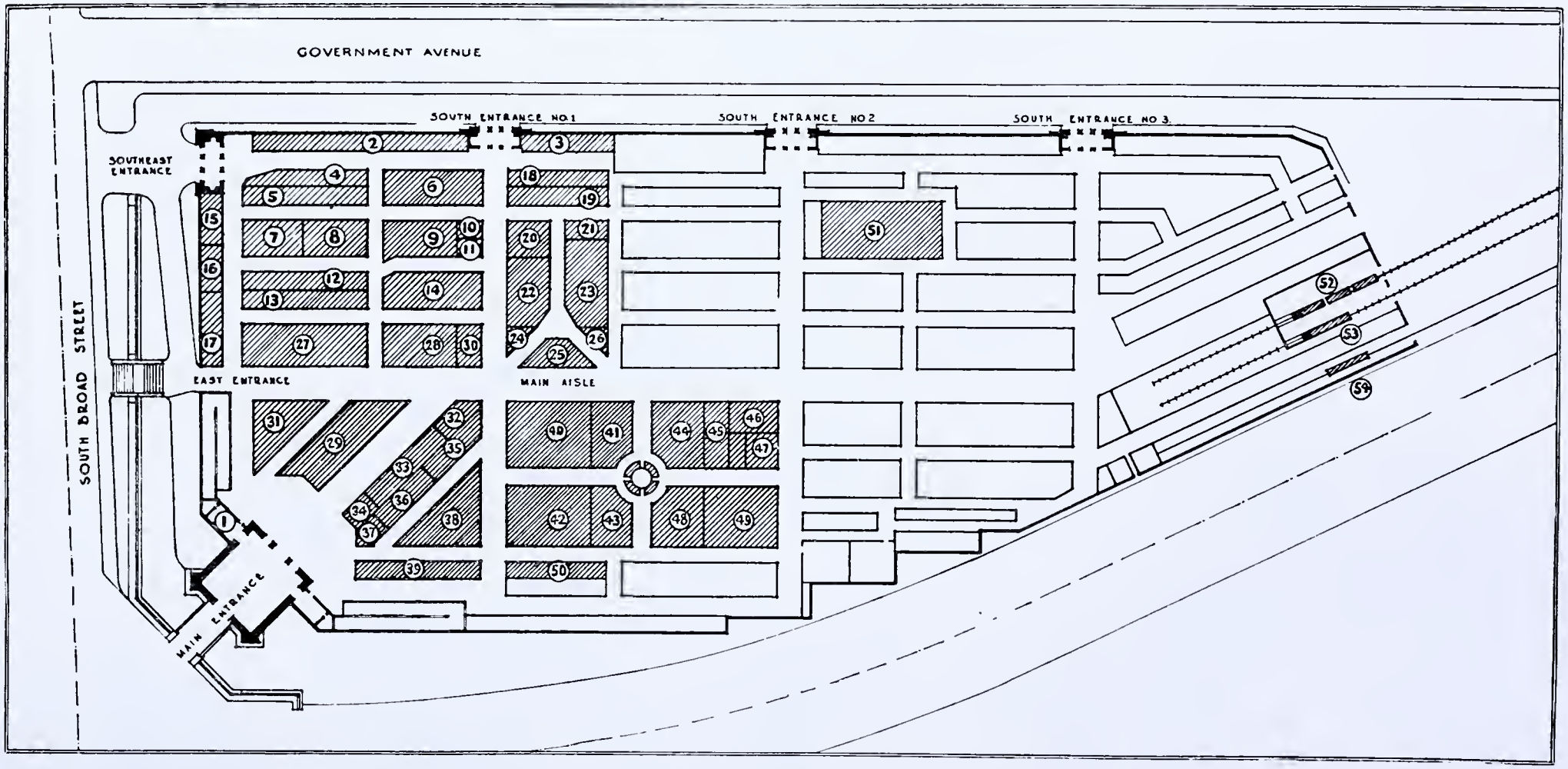

PLATE 3.—Floor Plan of Building No. 5 showing the location of the United States Government Exhibits. The location of the various Departments, Bureaus and Independent Offices are shown by numbers on the map which corresponds with the following list: United States Commissioner's Office, 1; Department of Labor, 2, 3 and 18; Department of Agriculture, 4 to 14; Civil Service Commission, 15; Federal Board for Vocational Education, 16; U. S. Veterans' Bureau, 17; Department of the Interior, 18 to 26; Smithsonian Institution, 27 to 29; Government Printing Office, 30; State Department, 31; Treasury Department, 32 to 34; Panama Canal, 35; Fine Arts Commission, 36; National Advisory Committee for Aeronautics, 37; Public Buildings and Public Parks, 38; U. S. Shipping Board, 39; Department of Commerce, 40 to 50; NC-4 Flying Boat, 51; Post Office Railway Car, 52; Mines Rescue Car, 53; Standard Test Weight Car, 54.

Motion Pictures

A motion picture projection unit was installed in a specially constructed booth in the auditorium of the Government Palace, where motion pictures were shown daily from 11.30 a. m. to 5.30 p. m. The films used were furnished by the Treasury, Navy, Interior, Agriculture, Commerce and Labor Departments and the United States Shipping Board. These films illustrated the operations of the departments and in an interesting and economical manner supplemented the other exhibits.

Awards Made by the Sesquicentennial International Exposition Jury of Awards to the U. S. Government Depts.

LIBRARY OF CONGRESS

GOLD MEDAL:

To the LIBRARY OF CONGRESS for the manuscript exhibits covering the early history of our country, and photographs and publications illustrating the activities of the Library.

GOVERNMENT PRINTING OFFICE

MEDAL OF HONOR:

To the GOVERNMENT PRINTING OFFICE for collective exhibit illustrating the development and activities of this branch of the Government Service. A well selected and admirably arranged and instructive display.

DEPARTMENT OF STATE

GRAND PRIZE:

To the DEPARTMENT OF STATE for collective exhibit for fitness of material selected, clearness of presentation and excellence of installation.

MEDAL OF HONOR:

To the DEPARTMENT OF STATE, maps of special design showing by colored flashlights the location of American Embassies and other diplomatic stations in foreign countries.

DEPARTMENT OF THE TREASURY

GRAND PRIZE:

To the DEPARTMENT OF THE TREASURY for comprehensiveness and general excellence of presentation of activities of the Department as a whole.

To the COAST GUARD for collective exhibit including building, illustrating equipment, historical development and present activities of the Coast Guard Service.

MEDAL OF HONOR:

To the PUBLIC HEALTH SERVICE for selection of health subjects and neatness of display, collective exhibit.

GOLD MEDAL:

To the PUBLIC HEALTH SERVICE for lifelike vaccination models showing types of reaction to small-pox vaccine.

To the PUBLIC HEALTH SERVICE for modern dental equipment unit for all dental surgery.

To the PUBLIC HEALTH SERVICE for chlorinating machines using chlorine for destroying germs in drinking water.

To the BUREAU OF ENGRAVING AND PRINTING for the collective exhibit of materials, and demonstrations of methods of printing Government certificates.

To BUREAU OF THE MINT for exhibit of materials and demonstration of methods of making United States medals and coins.

To the COAST GUARD for Coast Guard Cutter and Patrolboat on display and open to visitors at Pier 1, Navy Yard.

DEPARTMENT OF WAR

GRAND PRIZE:

To the DEPARTMENT OF WAR for active exhibit consisting of a detail of 55 officers and 1,000 men illustrating the different divisions of the Military Service, each with its proper equipment.

MEDAL OF HONOR:

To the DEPARTMENT OF WAR for camp and ceremonial activities, daily drills and frequent participations in official ceremonies of the exposition.

POST OFFICE DEPARTMENT

GRAND PRIZE:

To the POST OFFICE DEPARTMENT for its collective exhibit illustrating the development and activities of the divisions of the Service and organization of the entire Department.

MEDAL OF HONOR:

To the POST OFFICE DEPARTMENT for the Model Post Office in operation completely equipped with the most modern labor saving devices and standard furniture.

GOLD MEDAL:

To the POST OFFICE DEPARTMENT for the Railway Postal Car fully equipped and organized for service, which was open to the public.

To the POST OFFICE DEPARTMENT for the Air Mail Exhibit, electrically operated panoramic representation of airplane mail service across the continent.

DEPARTMENT OF THE NAVY

GRAND PRIZE:

To the DEPARTMENT OF THE NAVY for collective exhibit illustrating the history of the United States Navy and progress made in materials and methods.

MEDAL OF HONOR:

To the BUREAU OF MEDICINE AND SURGERY for collective exhibit illustrating improvements made in caring for the sick and injured on Naval vessels.

To the DEPARTMENT OF THE NAVY for collective exhibit of flags illustrating the evolution of the American Flag.

GOLD MEDAL:

To the UNITED STATES NAVAL ACADEMY for collective exhibit showing the life, educational facilities and instruction given at the Naval Academy at Annapolis, Md.

To the BUREAU OF CONSTRUCTION AND REPAIR for collective exhibit of Ship Models illustrating the development of ships from the days of John Paul Jones and the Frigate, to the modern swift and heavy armed battleship and airplane carrier of today.

To the NAVAL OBSERVATORY for collective exhibit illustrating the activities of the Naval Observatory and Time Service rendered.

To the BUREAU OF AERONAUTICS for collective exhibit of Naval Aeronautical material showing the progress made in aviation and the part the Navy has played in promoting this science.

To the UNITED STATES MARINE CORPS for collective exhibit, Tun Tavern and Model Camp representing the history of the Corps and its present high state of efficiency.

SILVER MEDAL:

To the HYDROGRAPHIC OFFICE OF THE NAVY for hydrographic material, maritime charts, and methods used in making them.

DEPARTMENT OF THE INTERIOR

GRAND PRIZE:

To the DEPARTMENT OF THE INTERIOR for its collective exhibit for comprehensiveness and general excellence of presentation of activities of the Department.

MEDAL OF HONOR:

To the BUREAU OF RECLAMATION for model of an irrigated farm, colored photographs and motion pictures, illustrating the results of Federal irrigation work.

To the OFFICE OF INDIAN AFFAIRS for collective exhibit illustrating Indian homes, arts, industries, and education.

To the BUREAU OF EDUCATION for collective exhibit illustrating education work, including kindergarten, primary and elementary schools, rural school organization, home education, etc.

GOLD MEDAL:

To the GENERAL LAND OFFICE for collective exhibit of maps, charts, surveying instruments, etc., connected with the work of the office.

To the NATIONAL PARK SERVICE for panoramic models in relief, colored photographs and motion pictures, illustrating the national parks.

To the GEOLOGICAL SURVEY for collective exhibit presenting geologic, topographic, hydrographic and conservation activities.

To the ALASKA RAILROAD for collective exhibit of panoramas, colored photographs and maps showing scenes along the Alaska Railroad.

SILVER MEDAL:

To the BUREAU OF PENSIONS for collective exhibit of historical and statistical material.

DEPARTMENT OF AGRICULTURE

GRAND PRIZE:

To the DEPARTMENT OF AGRICULTURE for its collective exhibit.

MEDAL OF HONOR:

To the OFFICE OF EXHIBITS for effective methods of presentation of subjects of agricultural interest.

To the BUREAU OF PLANT INDUSTRY for exhibit of the systematic classification of existing crop plant varieties and the introduction, adaptation and improvement of new varieties, including hays and forage.

To the BUREAU OF PLANT INDUSTRY for showing original research in the day-length requirements of plant life.

To the FOREST SERVICE for excellence of presentation of American forests; their waste and their preservation.

To the BUREAU OF SOILS for display of analysis and classification of typical soils of the United States.

To the BUREAU OF BIOLOGICAL SURVEY for exhibit showing the conservation utilization, and control of wild life.

To the BUREAU OF PUBLIC ROADS for historical presentation of the value and service of good roads and road construction.

GOLD MEDAL:

To the WEATHER BUREAU for original designs in meteorological instruments, weather forecasts and general Weather Bureau equipment.

To the BUREAU OF ANIMAL INDUSTRY for control of diseases and improvement of livestock shown in exhibit.

To the BUREAU OF DAIRY INDUSTRY for presentation of progress in American dairying from 1876 to 1926.

To the BUREAU OF CHEMISTRY for illustrations of applied chemistry on the farm and in the household.

To the BUREAU OF AGRICULTURAL ECONOMICS for exhibit on grading and standardization of farm products.

To the BUREAU OF HOME ECONOMICS for presentation of essentials in home economics.

To the FIXED NITROGEN RESEARCH LABORATORY for exhibits showing advances in production of nitrates from the air.

To the FEDERAL HORTICULTURAL BOARD for inspection and enforcing federal quarantine measures.

To the INSECTICIDE AND FUNGICIDE BOARD for exhibit showing regulatory work in composition and preparation of insecticides and fungicides.

To the OFFICE OF INFORMATION for presentation of distribution of agricultural information by bulletins and the press and radio service.

To the OFFICE OF MOTION PICTURES for educational film service in agricultural extension work.

SILVER MEDAL:

To the BUREAU OF ENTOMOLOGY for illustrating progress in applied entomology.

To the OFFICE OF AGRICULTURAL INSTRUCTION for presentation of service in teaching elements of agriculture.

HONORABLE MENTION:

To the OFFICE OF EXPERIMENT STATIONS for presentation of experiment station work.

To the OFFICE OF COOPERATIVE EXTENSION WORK for exhibit of cooperative service in aiding farmers.

DEPARTMENT OF COMMERCE

GRAND PRIZE:

To the DEPARTMENT OF COMMERCE for the collective exhibit of the Department as a whole for comprehensiveness and excellence of presentation of the work of the Department and demonstration of its service to the Country.

MEDAL OF HONOR:

To the BUREAU OF THE CENSUS for collective exhibit illustrating modern methods of gathering and presenting national statistics.

To the BUREAU OF THE CENSUS for tabulating machines employed by the Census Bureau in analyzing and tabulating population statistics, designed and made by employees of the Bureau.

To the COAST AND GEODETIC SURVEY for collective exhibit illustrating the activities of the Survey.

To the BUREAU OF FISHERIES for excellence and completeness of presentation of the fishing industries of the United States.

To the BUREAU OF FISHERIES for use of Fish Products and By-Products in the arts and industries.

To the BUREAU OF FOREIGN AND DOMESTIC COMMERCE for elaborate and instructive presentation of the World's Commerce.

To the BUREAU OF LIGHTHOUSES for a historical and comprehensive presentation of the Lighthouse Service from 1716 to 1926.

To the BUREAU OF LIGHTHOUSES for signal apparatus and machinery including the latest radio-beacon panel having an effective range over 100 miles.

To the BUREAU OF MINES for a collective exhibit demonstrating the technology of minerals and safety in mining.

To the BUREAU OF MINES for practical demonstration and exhibit of permissible mine machinery.

To the BUREAU OF MINES for exhibit of latest type of mine rescue car, fully equipped for service.

To the BUREAU OF MINES for display showing advancement in the economics and technology of minerals and metals.

To the BUREAU OF NAVIGATION for collective exhibit illustrating radio equipment and application in safe-guarding life and property at sea and in regulation of radio communication on land.

To the BUREAU OF STANDARDS for collective exhibit showing precise and practical standards and tests in applied physics and chemistry.

GOLD MEDAL:

To the DEPARTMENT OF COMMERCE for the central gallery of paintings envisioning the future of Commerce.

To the BUREAU OF THE CENSUS for electric chart demonstrating by ingeniously arranged colored flash-lights vital statistics.

To the COAST AND GEODETIC SURVEY for combined drag and sound-ranging models.

To the BUREAU OF FISHERIES for special display of the use of fish for sport, including anglers' supplies.

To the PATENT OFFICE for collective exhibit illustrating the progress of invention in the useful arts from 1790 to 1926.

To the STEAMBOAT INSPECTION SERVICE for a collective exhibit demonstrating the activities of the service as a whole in steamboat inspection for the protection of human life on American vessels.

To the NATIONAL COMMITTEE ON WOOD UTILIZATION for an exhibit demonstrating practical and profitable methods for the closer utilization of wood and wood-wastes.

SILVER MEDAL:

To the STEAMBOAT INSPECTION SERVICE for display of fully equipped life-boat of S. S. Roosevelt which saved crew of S. S. Antinoe in 1926.

DEPARTMENT OF LABOR

MEDAL OF HONOR:

To the DEPARTMENT OF LABOR for its collective exhibit embracing activities of the Secretary's Office, Women's Bureau and Children's Bureau.

To the CHILDREN'S BUREAU for its children's clinic and general excellence of its presentation of the needs of early childhood, including booth.

GOLD MEDAL:

To the CHILDREN'S BUREAU for large mural painting symbolizing our country's spirit of protection of childhood.

To the WOMEN'S BUREAU for display illustrating historical progress of women in industrial pursuits and development of their improved working conditions.

SMITHSONIAN INSTITUTION

MEDAL OF HONOR:

To the SMITHSONIAN INSTITUTION for collective exhibit including fossils from the Cambrian Rocks, and material from the Astrophysical Observatory.

To the NATIONAL MUSEUM for collective exhibit, natural history and historical material of great interest.

CIVIL SERVICE COMMISSION

GOLD MEDAL:

To the CIVIL SERVICE COMMISSION for collective exhibit showing organization and activities of the Commission.

UNITED STATES SHIPPING BOARD

GRAND PRIZE:

To the UNITED STATES SHIPPING BOARD for collective exhibit effectively illustrating the intent and purposes of the Board.

UNITED STATES VETERANS' BUREAU

MEDAL OF HONOR:

To the UNITED STATES VETERANS' BUREAU for collective exhibit, competent and artistic display representing the activities of the Bureau.

GOLD MEDAL:

To the UNITED STATES VETERANS' BUREAU for exhibit of Occupational Therapy demonstrating the health value of occupation in the treatment of diseases.

FEDERAL BOARD FOR VOCATIONAL EDUCATION

MEDAL OF HONOR:

To the FEDERAL BOARD FOR VOCATIONAL EDUCATION for collective exhibit illustrating the work of the Board in vocational education.

GOLD MEDAL:

To the FEDERAL BOARD FOR VOCATIONAL EDUCATION for painting, depicting in symbolic and literal form vocational education in the life of a community.

THE PANAMA CANAL

GOLD MEDAL:

To THE PANAMA CANAL for collective exhibit, photographs, statistical data, and maps including a relief map of the Canal.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

GRAND PRIZE:

To the NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS for collective exhibit of working models used in scientific research on the fundamental problems of flight.

GOLD MEDAL:

To the NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS for automatic recording instruments used in aeronautical research.

THE COMMISSION OF FINE ARTS

GOLD MEDAL:

To THE COMMISSION OF FINE ARTS for its collective exhibit of pictures illustrating buildings, plans and general view of the City of Washington.

OFFICE OF PUBLIC BUILDINGS AND PUBLIC PARKS OF THE NATIONAL CAPITAL

GOLD MEDAL:

To the OFFICE OF PUBLIC BUILDINGS AND PUBLIC PARKS OF THE NATIONAL CAPITAL for collective exhibit including many photographs, original plans of construction, and a model made to scale of the United States Capitol Building.

Financial Report

Public Resolution No. 7 of the 69th Congress authorized an appropriation of $2,186,500.00 for the participation of the Government of the United States in the Sesquicentennial International Exposition. This amount was appropriated in the Urgent Deficiencies Act, Public No. 36, approved March 3, 1926.

Of the $2,186,500.00 appropriated, Congress authorized that $1,000,000.00 be expended in construction of four or more buildings for exhibition purposes and that $250,000.00 be allocated to the War Department for its exhibits and $350,000.00 be allocated to the Navy Department, $100,000.00 for exhibits and $250,000.00 for repairs to the Navy Yard at Philadelphia incident to holding the Exposition. The balance of the appropriation, $586,500.00, was to be used for exhibits of the other Executive Departments and Independent Establishments of the Government which desired to exhibit. The Commissioner, after conferences with the various executive departments and independent establishments, which had signified their desire to exhibit, made the following allocations:

Agriculture Department	$85,000.00
Civil Service Commission	4,000.00
Commerce Department	100,000.00
Federal Board for Vocational Education	7,500.00
Fine Arts Commission	500.00
Government Printing Office	1,000.00
Interior Department	60,000.00
Labor Department	17,500.00
National Advisory Committee for Aeronautics	2,200.00
Panama Canal	1,850.00
Post Office Department	25,000.00
Public Buildings and Public Parks of the National Capital	3,000.00
Shipping Board	500.00
Smithsonian Institution	25,000.00
State Department	10,000.00
Treasury Department	57,000.00
Veterans' Bureau	7,500.00
	$407,550.00
Commissioner's Office	100,000.00
Reserve Fund	78,950.00
	$586,500.00

In some instances it was found that the preparation and maintenance of the exhibits could not be accomplished with the amount allocated. The Commissioner, upon a written statement showing the necessity for an additional amount, granted to the following departments the additional allocations:

Civil Service Commission	$1,000.00
Federal Board for Vocational Education	1,500.00
Fine Arts Commission	815.00
Labor Department	4,800.00
National Advisory Committee	900.00
Panama Canal	150.00
Public Buildings and Public Parks of the National Capital	1,000.00
State Department	500.00
	$10,665.00

On June 9, 1926, the National Sesquicentennial Exhibition Commission authorized an exhibit of Negro Activities under the supervision of the Department of Commerce, which was to include patents granted to negroes. An allotment was made for the preparation and maintenance of this exhibit of $4,500.00

On August 10, 1926, the Library of Congress informed the Commissioner that they had installed an exhibit at the Exposition but, not knowing at the time of installation that there was a Government appropriation available for payment of expenses, they had not requested any allotment of funds. At the time of making the request for an allotment, the exhibit having been installed, the total cost was known and the exact amount necessary to cover all expenses was allotted by the Commissioner, this amount being $300.00

$15,465.00

The allocation of the entire apprcpriation was as follows:

Construction of buildings	$1,000,000.00
Agriculture Department	85,000.00
Civil Service Commission	5,000.00
Commissioner's Office	100,000.00
Commerce Department	104,500.00

Federal Board for Vocational Education	9,000.00
Fine Arts Commission	1,315.00
Government Printing Office	1,000.00
Interior Department	60,000.00
Labor Department	22,300.00
Library of Congress	300.00
National Advisory Committee	3,100.00
Navy Department (Exhibits)	100,000.00
(Improvements of Philadelphia Navy Yard)	250,000.00
Panama Canal	2,000.00
Post Office Department	25,000.00
Public Buildings and Public Parks of the National Capital	4,000.00
Shipping Board	500.00
Smithsonian Institution	25,000.00
State Department	10,500.00
Treasury Department	57,000.00
Veterans' Bureau	7,500.00
War Department	250,000.00
Reserve Fund	63,485.00
	$2,186,500.00

The expenditures of the various allotments given above will be found in detail on annexed sheet.

All the usable exhibits and materials which were purchased by the various departments out of their allotments, were turned over to the departments in whose possession they were at the close of the exposition, for permanent use by that department. The scrap materials were sold.

On July 15, 1927, there remained unobligated of the total appropriation made the amount of $242,848.83.

NATIONAL SESQUICENTENNIAL EXHIBITION COMMISSION

STATEMENT SHOWING ALLOTMENTS, EXPENDITURES, AND BALANCES, BY DEPARTMENTS, AS OF JULY 15, 1927

Department	Allotment	Expenditures							Total Expenditure	Credits	Balance
		Salaries	Exhibits-Supplies-Materials	Travel and Subsistence	Freight-Drayage	Telephones and Telegraphing	Buildings	Miscellaneous			
Agriculture	$85,000.00	$25,179.63	$39,030.74	$12,568.69	$1,976.25	$83.85	.....	$23.50	$78,862.66	$3.48	$6,140.82
Civil Service Commission	5,000.00	81.50	3,086.04	1,481.03	221.85	.....	.....	18.00	4,888.42	.....	111.58
Commerce	104,500.00	14,579.56	53,137.08	14,589.53	3,193.51	135.66	.....	166.99	85,802.33	3.96	18,701.63
Commissioner's Office	100.000.00	52,025.75	.....	11,272.23	43.36	899.40	.....	[a]29,261.86	93,502.50	6.25	6,503.65
Commissioner's Building Fund	1,000,000.00	.....	.....	.....	.....	.....	1,000,000.00	.....	1,000,000.00	.....	.....
Federal Board Vocational Education	9,000.00	166.27	5,855 28	2,551.09	2.10	.....	.....	18.00	8,592.74	.....	407.26
Fine Arts Commission	1,315.00	43.75	1,083.25	99.01	.50	.....	.....	.....	1,226.51	.....	88.49
Government Printing Office	1,000.00	9.00	22.62	841.08	125.88	.....	.....	.....	998.58	.....	1.42
Interior	60,000.00	4,666.64	24,936.10	6,932.66	1,040.41	94.34	.....	401.52	38,071.67	.....	21.928.33
Labor	22,300.00	373.75	16,164.75	3,486.79	131.90	43.96	.....	354.15	20,555.30	.....	1,744.70
Library of Congress	300.00	.....	179.22	88.80	26.28	5.70	.....	.....	300.00	.....	.....
National Advisory Committee Aeronatuics	3,100.00	.....	668.52	1,802.76	219.85	.....	.....	24.00	2,715.13	.....	384.87
Improvements Philadelphia Navy Yard	250,000.00	.....	233.445.82	.....	.....	.....	.....	.....	233,445.82	1,746.96	18,301.14
Navy Department	100,000.00	1,548.63	63.965.02	4,964.59	2,852.97	.....	.....	.....	73,331.21	.....	26,668.79
Panama Canal	2,000.00	177.25	1,005.41	321.18	457.02	6.85	.....	.....	1,967.71	.....	32.29
Post Office Department	25,000.00	.....	18,990.72	2,902.39	31.90	16.93	.....	.....	21,941.94	.....	3,058.06
Public Buildings and Public Parks	4,000.00	1,132.15	1,443.38	849.87	571.57	3.03	.....	.....	4,000.00	.....	.....
United States Shipping Board	500.00	8.00	379.16	.....	9.23	.....	.....	18.00	414.39	.....	85.61
Smithsonian Institution	25,000.00	4,817.18	11,156.39	4,106.53	1,743.54	19.05	.....	.....	21,842.69	.....	3,157.31
State Department	10,500.00	328.52	5,782.00	2,411.82	196.25	258.15	.....	127.38	9,104.12	24.30	1,420.18
Treasury Department	57,000.00	6,923.07	27,666.94	5,314.56	540.10	49.48	.....	813.45	41,307.60	.....	15,692.40
United States Veterans Bureau	7,500.00	300.03	3,584.20	2,879.22	1.30	37.88	.....	28.00	6,830.63	.....	669.37
War Department	250,000.00	1,030.11	158,308.05	28,038.57	854.99	754.71	.....	.....	188,986.46	14.99	61,028.53
Reserve	63,485.00	.....	.....	.....	.....	.....	.....	.....	.....	[b]1,737.40	65,222.40
Total	$2,186,500.00	$113,390.82	$669,890.69	$107,502.40	$14,240.76	$2,408.99	$1,000,000.00	$31,254.85	$1,938,688.51	$3,537.34	$251,348.83

[a] Office equipment and supplies, rents, printing, decorations, entertaining, etc.

[b] Salary and expense refunds by Concessionaire and others.

THE LIBRARY OF CONGRESS

THE LIBRARY OF CONGRESS

Foreword

The classification of the exhibits determines the effective value of an exposition. It is a principle in classification that objects of the same general type must be kept together. Acting on this principle the exhibit of the Library of Congress was placed with that of the American Library Association in the Palace of Education. As the head of the library system of the country, this arrangement was peculiarly fitting and at the same time was a convenience to visitors wishing to study library methods of today.

The exhibits consisted of photographic reproductions of subjects selected to illustrate the magnificent library building, its interior ornate with beautifully colored mosaics and mural paintings, and its splendid reading rooms. There were photographs illustrating activities in the different divisions of the Library and some of its rarer collections of books and manuscripts. Among the latter were a number of documents of priceless value relating to political development of the United States, including some that recounted the thoughts and actions of our Forefathers when they launched among the nations of the world our great Republic. Chief among the photographs was one of the shrine wherein rest the originals of those revered documents, the Declaration of Independence and the Constitution of the United States, placed there February 28, 1924.

The exhibits were well chosen to illustrate the Library and its more important activities, and were all most appropriate for display at the Sesquicentennial celebration.

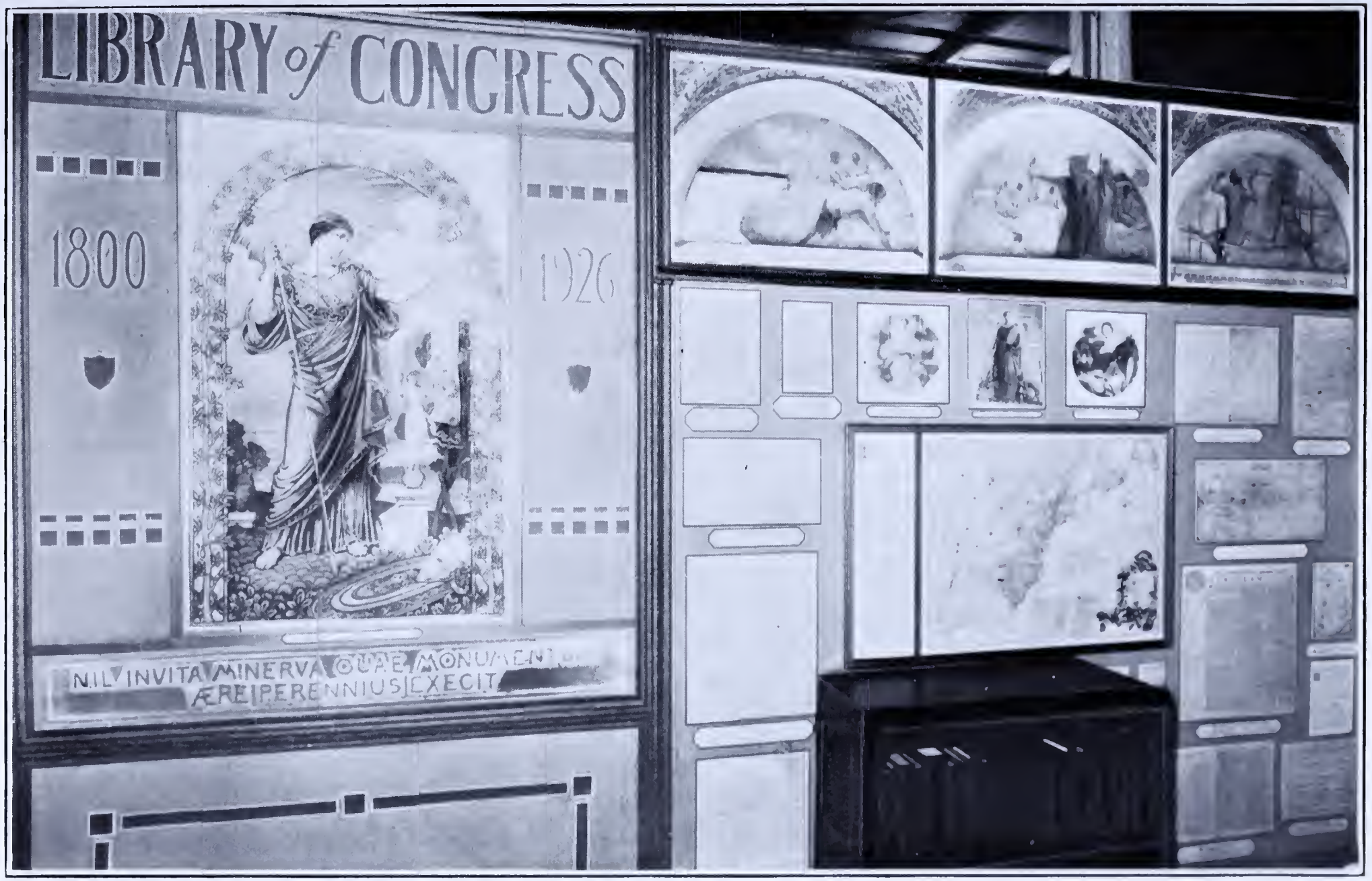

PLATE 6.—Partial view of Library of Congress exhibit, showing "Minerva," photograph of mosaic on left; Three mural paintings in "The Evolution of the Book," "The Cairn, Oral Tradition, Egyptian Hieroglyphics," on the right.

PLATE 7.—View showing three mural paintings in "The Evolution of the Book." "Picture Writing, The Manuscript Book, The Printing Press," and on top of the bookcase the Card Division Exhibit.

Exhibits of the Library of Congress at the Sesquicentennial Exposition 1926

Introduction

The exhibit of the Library of Congress was located with that of the American Library Association in the Palace of Education. It seems appropriate that this action be taken in view of the position of the Library of Congress as the head of the library system of the country. And, as The National Library, it has had for the past quarter of a century, a marked influence upon library systems both in this country and abroad.

The Sesquicentennial Exposition being held in celebration of the signing of the Declaration of Independence, it was decided to emphasize the richness of the manuscript collection of the Library especially for the period covering the early history of the country. Among the many of the *historica monumenta* in the library are the originals of the Declaration of Independence and the Constitution of the United States. These documents were transferred from the Department of State to the Library of Congress under an Executive order of the President dated September 29, 1921. While it was not feasible to display the originals of these and the other rare early American manuscripts, a very serviceable substitute was provided by means of photographic and photostatic prints.

Description of the Exhibits

The Library exhibit comprised four panels arranged in the form of a square with one panel projecting into the aisle. On this latter panel was displayed a large sepia photograph of the "Minerva of Peace" by Elihu Vedder—the original mosaic being in the Library and located on stairway leading to the gallery of the Reading Room. (Plate 6).

Above the two side panels were two triptychs containing photographs of the six stages in "The Evolution of the Book"—a mural painting by John W. Alexander, located in the main hall of the Library near the office of the Librarian. (Plate 7).

Above the centre panel was an enlarged photograph of the exterior of the Library building and of the seal of the Library of Congress and of the seal of the Library of Congress Trust Fund Board.

Historical Manuscripts

To illustrate the political development of the United States as a nation, a selection was made of various original manuscript records in the possession of the Library and they were reproduced, with the best possible effect, by photographic and photostatic processes.

As exhibited the central points of interest were the Declaration of Independence and the Constitution of the United States; the other documents were grouped around these. A photograph of a page of the Columbus Codex established a logical starting point for this exhibition of America's manuscript records. This parchment record was made under the personal supervision of Columbus about the year 1500 and consists of accurate transcripts of the powers, privileges and honors bestowed on the great navigator by King Ferdinand and Queen Isabella.

Two pages from the orders of Major General Edward Braddock, in his illstarred expedition of 1755, recalled the Colonial period of the Nation's history and the interest in these facsimiles was enhanced by the fact that these orders were in the handwriting of Colonel George Washington, then a special aide to the British general.

The beginning of the trouble with the Mother Country was illustrated by a reproduction of the title-page of Britain's official publication of the Stamp Act, in 1765. The Articles of Association of the First Continental Congress, in 1774, naturally follow, as the colonists struggled to organize against oppression.

The next step was armed resistance and this was typified by the reproduction of the Commission of General George Washington, as commander in chief of the armies that sustained the revolt.

The political difficulties were illustrated by the Agreement of Secrecy, of the Continental Congress, November 9, 1775, which bound the delegates by the ties of honor and love of country not to divulge the proceedings of the Congress without permission and penalized them by expulsion from Congress and treatment accorded to the enemies of the liberty of America.

The documents in the immediate proximity of the Declaration itself were Richard Henry Lee's motion for independence, June 7, 1776, and the draft, in Thomas Jefferson's handwriting of his proposed form of the Declaration. This document was, practically, the report of the Committee appointed by Congress to draft a declaration and it shows, by Jefferson's marks, the portions changed or left out by the Congress. Next to the Declaration itself, it is of the highest value to America's historical record.

The Declaration of Independence itself was represented by as perfect a photograph as it was possible to obtain; the exact size of original.

Independence declared, the next step was the formation of a general or central government and the illustration of this was the Articles of Confederation (the first Constitution of a United States), drafted in 1776-1777 and finally agreed to in 1781.

The first and last pages of the British capitulation at Yorktown, the surrender that virtually ended the war, are shown, followed by the official proclamation of the Continental Congress, proclaiming the ratification of the Treaty of peace with Great Britain.

The War over and Independence won, the efforts to stabilize the government were illustrated by the last page of the proceedings of the Annapolis Convention in 1786, which had met to bring about closer political cooperation between the loosely organized state units. This Convention disclosed the absolute necessity for the creation of broader powers of centralized government and the call was issued for a convention of delegates from all the states. This Convention met in Philadelphia the following year and created, after four months of toil, the present Constitution of the United States, the first and last pages of which were shown in facsimile.

Activities of the Divisions of the Library

Photographic prints of certain of the Divisions of the Library were displayed. These comprised:

The Reading Room
Service for the Blind
Senators' Reading Room
Representatives' Reading Room
Manuscripts
Periodicals
Copyright Office
Catalogue
Maps and Charts
Office of Superintendent of Reading Room
Bibliography
Prints
Documents
Music
Cards
Law Library
Classification

Special Collections

Three of our many special collections were, in each case, briefly described by means of a one page broadside. These collections were Slavic (over 100,000 volumes), Semitic (over 25,000 volumes), and Chinese (over 80,000 volumes). In certain fields each of these collections is preeminent. Accompanying these descriptions were photostatic copies of a page from a manuscript Haggadah of the fifteenth century; of a page from the manuscript journal in Russian of the sailing ship "Tri Sviatitelia" used by Grigorii Shelekhov, who discovered the islands

of "Kyktaka" and "Apagnaka" off the Alaskan coast in 1783-84; of a page of "Sung Chao Chu Ch'en I"—a Sung Dynasty petition to the Emperor. These special collections are indicative of the wide and varied development of the National Library.

Publications

Directly in front of the center panels were two sectional book-cases. In these two book-cases was a representative collection of 170 of the Library publications issued since 1897. The collection was necessarily a small one due to the limited space available. If there were more than one volume to a set of a particular publication only one volume was included except in the case of the "Journals of the Continental Congress" (25 volumes so far issued) three volumes were selected.

This collection of publications included not only those of original texts, e. g., the "Journals of the Continental Congress" and the "Records of the Virginia Company" but also calendars of manuscripts, select bibliographical lists in the fields of history, political science, economics and other subjects, indexes of laws, guides to foreign laws, classification schedules, rules for cataloguing including also subject headings, catalogues and lists in the fields of art, music and geography, check lists of newspapers, lists of American Doctoral dissertations, Monthly Check Lists of U. S. State publications, etc.

Map

"The Thirteen Original Colonies as they appeared to geographers and makers of maps at the time of The Declaration of Independence."

This is a facsimile of a portion of an old map in the Library of Congress, entitled "British and French Dominions in North America," compiled by John Mitchell, a Virginia physician, published at the request of the British government's Board of Trade in London in 1755, and reprinted on the original scale at least seventeen times before 1792 either in England, France, Holland, or Italy.

This copy of Mitchell's map was colored by Col. Lawrence Martin, Chief of the Library's Division of Maps in May, 1926, to show the Thirteen Original Colonies, the territory northwest of the Ohio River, disputed areas, the British, Spanish, and French neighbors of the Thirteen Original Colonies, and the boundary of the United States, as fixed in 1782-83.

Mitchell's map is, without question, the most important and useful map in American history. A copy of one of the English editions was used by Franklin, Adams, Jay, and Laurens, the American peace com-

missioners, in boundary negotiations with the British at Paris in 1782; a copy of one of the French editions was employed in American boundary discussions with Spain and with France at Paris in the same year; Mitchell's map has frequently hung in the halls of Congress; it has furnished material evidence in connection with a great many American boundary disputes from 1783 to 1926.

Part or all of this map has been reproduced in facsimile by the United States government (many times between 1829 and 1925) by the states of Massachusetts, Maine, Maryland, and Virginia, by the historical societies of New York, Michigan, Wisconsin, and Minnesota, by the Royal Society of Canada, by the Department of Crown Lands of Quebec, by the government of Canada (1910 and 1926) and by the British Foreign Office, as well as by the authors of many American, British, Spanish and French books.

Service for the Blind

A description of the important Service for the Blind was given by means of a one page broadside accompanied by a photograph of the interior of the Reading Room for the Blind.

This Reading Room for the Blind is used by more than 2,500 readers annually. With a collection of nearly 14,000 embossed books its service to the blind is national in its scope—sending out to every state in the Union loans aggregating over 43,000 volumes a year. These volumes are, under the law, sent through the mail post-free.

Music Collection

This collection described with the aid of a broadside now comprises 1,007,007 volumes, pamphlets, etc.

Quantitatively the collection is surpassed by only one or two libraries in Europe. In America it is without a rival. As regards the musical publications of the last fifty years, it is unexcelled anywhere. Its collections of opera scores and opera libretti are the largest of their kind in the world. The collection of early music printed in America (ca. 1775 to 1825) is of great importance.

The number of gifts to the Music division is constantly increasing. These gifts range in size from a single sheet of music to the "Elizabeth Sprague Coolidge Foundation" and the Chamber Music Auditorium given by Mrs. Coolidge in 1925—foundation and auditorium representing a gift of more than $500,000.

Auditorium for Chamber Music

Endowment by Mrs. Elizabeth Sprague Coolidge

Adjacent to the view of the interior of the Music Division was a photograph of the interior of the auditorium for chamber music. This auditorium is the gift of Mrs. Elizabeth Sprague Coolidge. It is a rectangle, stretching across the north end of the northwest (inner) courtyard, and reaches only to the level of the main floor. It has a seating capacity of 511. A tablet in the lobby (on the west) identifying the structure as a gift of Mrs. Coolidge was itself a gift from certain lovers of Chamber music.

Joseph Pennell Bequest

Through the will of Mr. Joseph Pennell, who died April 23, 1926, the Library will ultimately receive all of his collections not already presented to it, and also, subject to the life interest of Mrs. Pennell, his entire personal estate. The collection will constitute a notable addition, and the personal estate a substantial one. The latter is to constitute an endowment, the income of which is to be applied to the purchase of prints and the foundation of a bureau of Chalcography, whose service is the restriking of notable engravings, etchings, and other prints, and the sale of them at cost. In view of the significance of this bequest it seemed appropriate to exhibit a photograph of the memorial panel now in the Division of Prints. It comprised a lithographic portrait of Mr. Pennell and a collection of ten representative lithographs and etchings by him.

Library of Congress Trust Fund Board

An act of Congress approved March 3, 1925, provided for the Library of Congress Trust Fund Board—a quasi corporation with perpetual succession and all the usual powers of a trustee, including the power to invest, reinvest, and retain investments, and, specifically, the authority to accept, receive, hold and administer such gifts or bequests of personal property for the benefit of, or in connection with, the Library, its collections, or its service. A brochure indicating the occasion for the act providing for this Board and the need of endowments by the Library and also discussing the constitution, organization, resources and service of the Library was available at the exhibit for examination by all those who were interested.

This Board is now administering two endowments: one of $100,000 given by James Benjamin Wilbur, a portion of the income of which is

to be used for acquiring historical source material (chiefly in photostat or other reproductions) and one of $10,000 given by Richard Rogers Bowker, a portion of the income of which is to be used for the bibliographical service of the Library. The Board is now also the Trustee of part of the endowment (for Music) by Mrs. E. S. Coolidge.

A photographic copy (enlarged) of the seal of the Trust Fund Board was placed on a panel to the right of the photograph of the exterior of the Library Building.

Mural Decorations

Those in the Library of Congress represented in the exhibit in photographic reproduction, in addition to "The Evolution of the Book" by John W. Alexander and the "Minerva of Peace" (mosaic) by Elihu Vedder, were "Understanding" by Robert Reid, "Thalia" by Frank W. Benson and "History" (mosaic) by Frederick Dielman.

Card Division

A cabinet containing an exhibit of the printed catalogue cards of the Library of Congress, designed to show the character of the cards and how they are used by the Library of Congress and by libraries subscribing to them in compiling catalogues of various types, was displayed.

The exhibit comprised:

I. Reproduction of section of the public catalogue of the Library of Congress containing the entries Phelps-Philadelphia, to illustrate the use of the cards in dictionary catalogues.

II. The same selection of cards in classed arrangement according to the L. C. System of classification, to illustrate the use of the cards and the L. C. System of classification in classed catalogues and bibliographies.

III. Selection of L. C. cards for national documents of the United States and foreign countries and for the documents of the State governments of U. S. A., to illustrate use of cards in an author catalogue and the L. C. method of cataloging documents.

IV. Pamphlet "L. C. Printed Cards" (distributed gratis) containing a succinct explanation of methods of ordering and using the cards.

V. Miscellaneous samples of the cards (distributed gratis).

This Card activity of the Library is more than self-supporting. The cards are sold to more than 4,000 libraries, other learned institutions, and individuals—the receipts from sales, which are turned into the United States Treasury, will, this year, be in excess of $200,000.

Nearly 1,000,000 different titles are already represented in the stock which now numbers about 75,000,000 cards.

Certain libraries in leading centres of research have been made depositories for complete sets of these cards. By consulting a depository set one may ascertain whether a certain book is in the Library of Congress.

Equipment

The new bookstack now under construction in the Northeast Court at a cost of $745,000 was described in brief detail by means of a one page broadside. This bookstack will contain 14 levels or "decks." Together they will contain over 160,000 linear feet of steel shelving which will add over 30 miles of shelving to the 102 miles already provided in the other stacks. This additional shelving will accommodate 1,750,000 volumes of ordinary sizes and 50,000 folios.

The uppermost deck is to afford specially protected quarters for rare books and special facilities for research—over 30 private rooms being there provided for serious investigators.

THE GOVERNMENT PRINTING OFFICE

THE GOVERNMENT PRINTING OFFICE

Foreword

The United States Government Printing Office is the largest publishing house in the world, and there is none more completely or better equipped. Among the items that enter into a day's work are the delivery of 315,000 copies of government publications, the printing of 4,000,000 postal cards and 12,600,000 printed pages of book work. Every year it uses 42,000,000 pounds of paper, 100,000 square feet of leather, and 22,000,000 square inches of gold leaf and other stamping materials. It carries a daily payroll of $27,000.

The exhibit of this great establishment was confined within narrow limits, but it told a most interesting story of its many activities and varied and extensive products. Its productions in the printing line run into figures quite beyond human conception, and examples of its press work and binding demonstrated a skill in execution of the highest order both in workmanship and artistic design.

The materials within the exhibit cases were well selected and fully labelled. Few displays were more comprehensive or informative than those from the Government Printing Office, an establishment which manufactures most of the supplies it uses, and whose products are found in every home of our Republic.

Exhibits of the Government Printing Office at the Sesquicentennial Exposition 1926

Introduction

The Government Printing Office exhibit did not attempt to show progress in the printing industry by comparing its products with those of any previous time, but its purpose was to give the visitor an idea of the advancement that has been made in the art of printing, and scope of work done by the Office.

The Government Printing Office is the largest and best equipped printing and binding plant in the world. Its magnitude is best illustrated by the following statement of facts and figures:

Materials and Supplies Used in One Year's Operation

60,000	pounds of glue
12,000,000	yards of wire
42,000,000	pounds of paper
16,000,000	cubic feet of gas
100,000	square feet of leather
200,000	yards of binding cloth
3,900	rollers (made on premises)
28,000,000	yards of sewing thread
3,000,000	containers for postal cards
118,000	pounds of ink (made on premises)
5,000,000	kilowatt hours of electric current
13,000,000	feet of monotype keyboard paper
4,000	tons of metal for typesetting machines
22,000,000	square inches of gold leaf and other stamping materials

The Amount of Work Produced in One Average Day

70,000	sheets ruled
750,000	sheets folded
500	forms put to press
6,700,000	ems of type set
150,000	copies wire-stitched
250	number of jobs completed
5,000,000	and more postal cards printed

PLATE 8.—Exhibit of the Government Printing Office.

700,000 money-order blanks printed
300 halftones and line etchings made
12,600,000 pages of book work printed
315,000 copies of publications delivered
35,000 square inches of electrotype and sterotype plates
$37,000 value of output
$27,000 compensation of employees

Description of the Exhibits

The exhibits were shown in eight cases. (Plate 8). The contents of each case is herewith described.

Case One

Samples of books bound in full morocco, hand tooled, with inlaid leather in suitable color to embellish the finished design, which is the usual style of binding for books of value.

Volume of the Presidents' addresses, bound in accordance with his selection in full blue morocco flexible binding, decorated with the seal of the President of the United States showing four stars, one on each corner of the front cover, resembling his flag.

Specimens of blank books in full russia, extra bands with elaborate finishing and paneled sides.

Cloth bound or edition bound books, showing the various styles of binding from sewing to completion. In all binding operations the latest improved machinery is used in place of the hand method employed until within the last twenty years.

Case Two

Exhibit of press-proof titles showing the care and attention given to titles, which are the reader's first introduction to a book and which give him his first impression of the volume.

Exhibit of typography, simple and complicated, and illustrations to show the effort made to present pleasing, harmonious, up-to-date work. This exhibit also showed the work of the apprentices.

Specimen volumes of the proceedings of Congress from its first session to date, displaying one volume each of the four series into which they were bound.

Annals of Congress.....1789-1824
Register of Debates 1824-1837
Congressional Globe 1833-1873
Congressional Record 1873-1926

Copy of the Report of American Battle Monument Commission, cloth bound, and copy of the Origin and Evolution of the United States Flag, paper bound, selected to show style of binding and illustrations used for books of this character.

Case Three

Miscellaneous collection of pamphlets published by the various departments of the Government, illustrating the variety of subjects covered, and several issues of Farmers' Bulletins showing progress in style and attractiveness made in the past fifteen years.

Case Four

Specimens of repair work done by the Branch Bindery in the Library of Congress, with exhibits of old manuscripts, illustrations, and etchings which have been repaired and covered with mouselline for the purpose of preserving them for future use.

Process employed to permanently restore and preserve the old manuscripts and valuable state papers which might otherwise be lost by decay and deterioration. This process is over 100 years old and has been very extensively used by the Government bindery in the last 30 years.

Display of weekly and monthly publications issued by the departments to illustrate the attractive appearance of periodicals prepared by the Government departments for the purpose of disseminating special information.

Case Five

Samples of black and three and four-color printing.

Progressive proofs showing the method pursued in printing process work in yellow, red, blue and black, and their appearance when the colors are super-imposed.

Sample of the "Grant Memorial" book shows the results obtained from two colors, a dark green and brown ink.

Samples of marbled paper now done on the printing press, which was formerly a slow hand process.

Postal cards exhibited are printed at the Government Printing Office on web presses, each press turning out approximately 2,500,000 cards every eight hours.

Money order blanks exhibited are also printed on web presses with a yearly output of approximately 220,000,000 blanks. Sheets are printed both sides, perforated, numbered, and the seal over-printed in blue ink in one operation.

Case Six

Specimens

Halftone molded in lead.
Shell of a lead mold.
Flat stereotype plate—an amalgam of lead, tin, and antimony.
Curve stereotype plate—cast in curve casting box.
Flat and curved stereotype plate, nickeled.
Flat stereotype and electrotype plate, chromium plated.
Paper mache matrix—a combination of specially prepared paper, tissue paper, and a special paste.
Flat electrotype plate—a copper shell reinforced with lead.
Electrotype curve plate.
Electrotype flat and curved plate, nickeled.
Gutta percha plate—this method of platemaking is now obsolete.

It is a long stride from the old method of clay mold and gutta percha platemaking to the present process of paper mache, which allows either a flat or curve or both flat and curve from the same matrix. Stereotyping is the most economical process of platemaking.

While the purpose of both the stereotype and the electrotype plate is to replace the type form in printing, the stereotype plate, on account of its relatively soft face, is used on publications of small editions, while the electrotype plate, with the hard copper face, is preferred for printing publications with large editions, and those of finer specimens of printing. The processes of electrotyping and stereotyping are very different. The nickel, of course, prolongs the life of the electrotype plate as well as that of the stereotype plate.

Exhibit of Photo-engraving

An original photograph.
A halftone negative.
A plain piece of copper.
A print from halftone negative on copper.
An etched and re-etched copper plate, and a proof of same.
A pen and ink drawing of various subjects.
A line negative.
A plain piece of zinc.
A print from the line negative on zinc.
An etched zinc plate and a proof of same.
A few samples of brass dies.
Sample bottles of chemicals used in the making of a zinc cut, a copper halftone, and brass dies.

Case Seven

Specifications used by the Government Printing Office in the purchase of paper, together with representative standard samples covered by the specifications.

Results of cooperative work being carried on jointly by the Government Printing Office and the United Typothetae of America with the paper manufacturers for the purpose of establishing a technical standardization of paper.

Results of investigational work conducted on flexible glues for use in the Bindery, together with specifications for the purchase of glue. Also photographs showing the methods of handling glue, which were adopted as a result of technical investigations.

Copies of the tentative specifications proposed for bond and ledger papers together with tabulations of the complete technical tests made on two sets of samples submitted by paper manufacturers of their regular mill brand bond and ledger papers.

Case Eight

Specifications for miscellaneous materials purchased by the office, such as ink making ingredients, type metals, flax book twine, bookbinding cloths, and bookbinding leathers.

Results of investigational work conducted on flax book twine, type metal of various kinds, ruling inks, and various types of bookbinding cloths and bookbinding leathers.

Samples of type metal:

Showing the effects of small amounts of copper on the structure of type metal alloy.

Showing the effects of the rate of cooling on the grain of type alloys.

Report cards showing how technical control is maintained over all type metals.

Samples of ruling work emphasizing the lack of resistance to light exposure of various kinds of dyes commonly used for ruling, and samples of ruling work using dyes recommended for high grade and permanent ruling, possessing better working qualities and permanency to exposure to light.

Views of the laboratory and also typical test report cards used in reporting the results of technical tests on paper, textiles, ink ingredients, gasolines, lubricating oils, etc.

THE DEPARTMENT OF STATE

THE DEPARTMENT OF STATE

Foreword

The exhibit made by the Department of State was admirably suited to commemorate the one hundred and fiftieth anniversary of the Nation's independence. The neatly constructed cases, their arrangement on the space assigned, and the installation of the exhibit material itself combined to give a dignity to the presentation that was particularly pleasing. Prominent among the exhibits were those two historic documents, the Declaration of Independence and the Constitution of the United States. The courage and the patriotism that filled and directed the minds of those remarkable men who prepared and signed them have from the beginning and will ever continue to be a source of inspiration to all true Americans.

The exhibit contained many state papers relating to the political organization of our country, and its relations with foreign nations. There were notable Presidential proclamations, ceremonial letters interchanged and treaties made with foreign nations, demonstrations of how Federal laws are made besides many interesting and attractive objects, all possessing some national or international significance. The feature exhibit was a large map of the world upon which was shown by vari-colored electric flashlights the location, and character of our embassies, legations and other displomatic agencies in all foreign countries.

From this map one reads the story of the wonderful growth made by our country under the influence of the declaration of 1776 and guidance of our glorious Constitution, while the entire collection sets forth activities of the State Department that have helped to place the United States of America among the foremost nations of he earth.

PLATE 9.—Partial view of the exhibit of the Department of State.

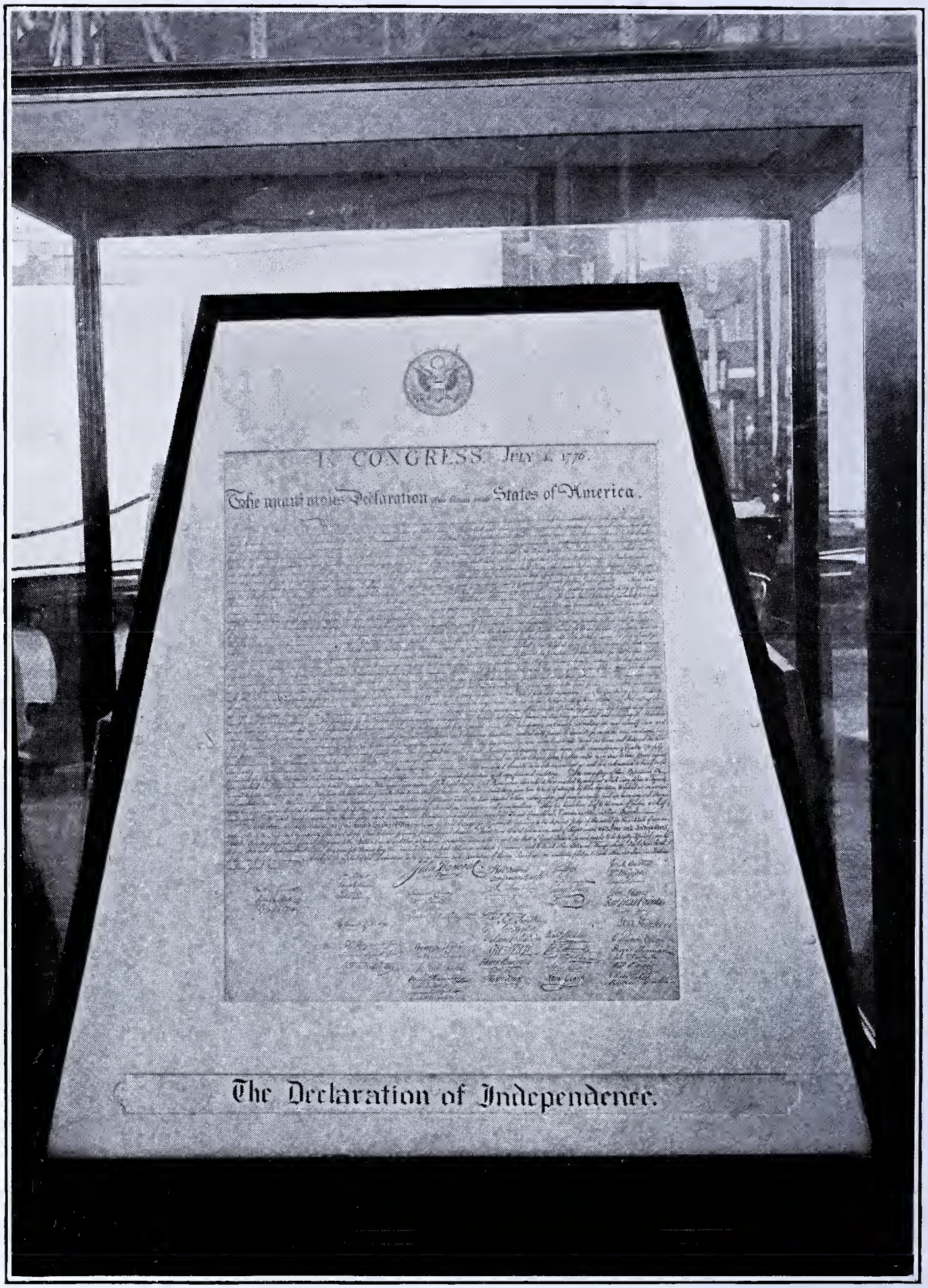

PLATE 10.—Engrossed copy of the Declaration of Independence.

Exhibits of the Department of State at the Sesquicentennial Exposition 1926

Introduction

The exhibit of the State Department occupied approximately 1,900 square feet of space on a triangular platform conspicuously placed in front of the main entrance to the building and the exhibit was generally admired for its completeness and arrangement. A partial view of the exhibit is shown on (Plate 9).

Carrying out the purpose of the exposition as defined by Congress the Department of State gave prominence to certain historical documents peculiarly appropriate to the celebration of the one hundred and fiftieth anniversary of the signing of the Declaration of Independence.

Description of the Exhibits

Reproductions of the following documents were displayed:

The original draft of the Declaration of Independence in the handwriting of Thomas Jefferson, with interlineations by Benjamin Franklin and John Adams, and the engrossed copy of the Declaration of Independence. (Plate 10) In the same case with these two documents were photographs of the Liberty Bell, the house in which Jefferson wrote the Declaration, and Independence Hall, Philadelphia, in which the Declaration of Independence was signed, and portraits of the drafting committee. (Plate 11)

Other historical documents, in upright glass cases, in their chronological order were the following:

The Treaty of Peace of 1783 with Great Britain, terminating the Revolutionary War; the Constitution of the United States with certain amendments thereto, and an illustration showing how the Constitution is amended; the Treaty of 1794 between the United States and Great Britain (the Jay Treaty), establishing friendship, commerce and navigation between the respective countries; the Treaty of 1814 between the United States and Great Britain (Treaty of Ghent) terminating the War of 1812; the Treaty of Guadalupe-Hidalgo, terminating the War with Mexico; the Treaty of Paris, terminating the Spanish-American War, and the Treaty between the United States and Tripoli, known as the treaty with the Barbary Power. A special case was devoted to an exhibit showing in documentary form, the various steps taken in negotiating a treaty, using as an illustration the treaty restoring friendly relations between the United States and Germany.

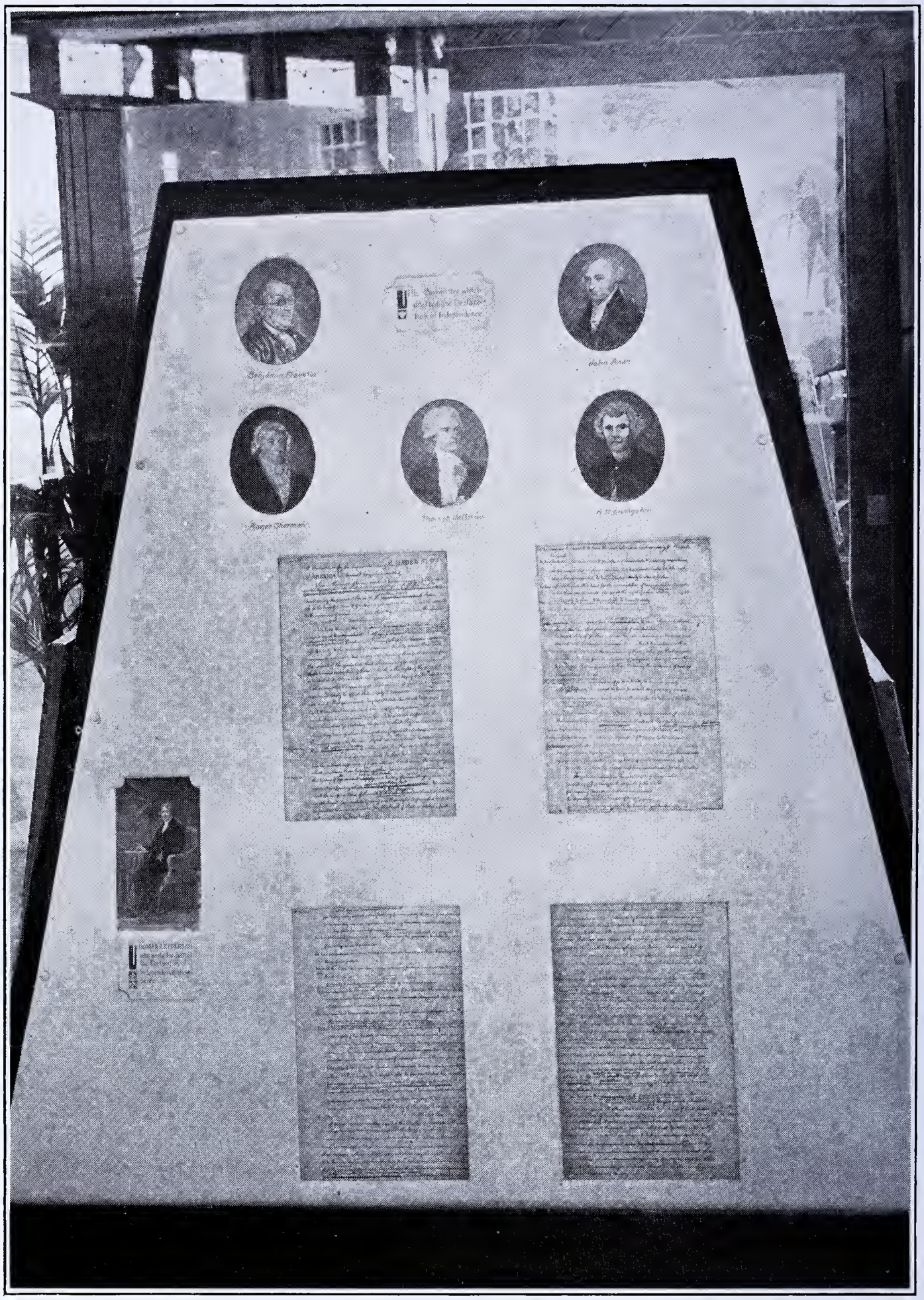

PLATE 11.—Portraits of Drafting Committee, and original draft of the Declaration of Independence.

PLATE 12.—Reproduction of the Great Seal of the United States, with explanatory notes.

PLATE 13.—Map of the world showing various classes of American diplomatic and consular offices and their locations.

As of further historical interest there was displayed certain notable Presidential proclamations, namely the celebrated Emancipation Proclamation of President Lincoln, the Proclamation of President Tavlor establishing ports of delivery in the Territory of Oregon and Thanksgiving Proclamations of Presidents Washington and Coolidge.

In accordance with the Resolution of Congress, the functions and administrative faculties of the Department were demonstrated in the following manner:

In upright glass cases similar to those containing the historical exhibits the hereinafter named exhibits were displayed. A large photolithographed reproduction in colors of the *Great Seal* of the United States with explanatory notes relative to the history of the Seal and the purposes for which it is used. (Plate 12.) The original of the Great Seal is in the custody of the Department of State. The American passport, old and new forms, and a diplomatic passport, with foreign visas, explanations of fees charged for visaing passports, nature of a passport, chart showing great increase in number of passports issued and forms used by the Department in authenticating documents; ceremonial letters from the President of the United States to the heads of other Governments, ceremonial letters from the heads of other Governments to the President; commissions issued by the Government and documents showing recognition of foreign consular officers by the United States Government were also exhibited.

The procedure showing how a law is made was exemplified in an exhibit indicating legislative and executive action in connection therewith. The Department of State is the repository of all Federal laws.

An attractive feature of the exhibit was the display of types of decorations conferred on American citizens by foreign Governments, testimonials awarded to foreigners for rescue of American vessels at sea, ornate letters of credence and curios sent to the Department of State from abroad.

An outstanding feature of the exhibit which commanded universal attention was a large map of the world ten feet high and twenty-four feet long, mounted on a three section mahogany frame, surmounted by a large gilt globe, which showed by means of varicolored electric lights the various classes of the American diplomatic and consular offices and their locations. (Plate 13). This map, together with certain printed matter, was used in explaining the scope of activities of the American foreign service and called forth much favorable comment.

A collection of portraits and photographs displayed in a rack with swinging leaves designed for the purpose proved to be of special interest to all visitors. The collection included portraits of the signers

of the Declaration of Independence, Presidents of the United States, Secretaries of State of the United States, present officials of the Department of State, photographs of national capitols of the United States, photographs of certain American embassy, legation, and consular buildings, chart showing duties performed by American consular officers; chart showing dates of ratification of the Constitution and dates of admission of new states into the Union and a chart showing United States immigration quotas of foreign countries. At either end of the exhibit resting upon white marble pedestals were heroic sized bronze busts of Washington and Lafayette.

For the benefit of the public much information was disseminated through the distribution of printed matter concerning the history of the Department of State, the American foreign service, and the duties and activities of American consuls in rendering services to other branches of the Government as well as to individual American citizens. By means of the information so disseminated, public interest in foreign affairs was stimulated and the public mind was awakened to the importance and value of our foreign service. The interest so evinced and the expressions of praise by the more enlightened and intellectual class of visitors to the exhibit were a source of great gratification to the Department.

THE DEPARTMENT OF THE TREASURY

THE DEPARTMENT OF THE TREASURY

Foreword

Nothing commands such universal attention as money. Ages ago the love of money was pronounced the root of all evil but that does not lessen the desire to see how it is made, more especially to see how it is made by the Government.

In the Department of the Treasury are two bureaus whose functions are to make United States money—the Mint and the Bureau of Engraving and Printing. How these two agencies make coins and print Treasury notes, postage stamps, and Government certificates, was demonstrated every day on Government printing presses. These demonstrations never failed to draw crowds eager to watch the operations and examine the results.

The work of the Public Health Service, also a Bureau of the Treasury Department, was illustrated by well selected material, nearly all of vital human interest, and the large number of visitors who viewed this exhibit and who sought information as to how to keep well, and especially how to avoid contagious diseases, indicated its popularity and general appreciation.

The Coast Guard, an important branch of the Treasury Department, had a typical Station Building, beautifully located on the banks of Edgewater Lake, where the life-saving crew gave daily demonstrations in the handling of the surfboat, the use of the breeches buoy in rescuing the shipwrecked, and the resuscitation of those apparently drowned. Within the Station Building were assembled and attractively installed a large number of exceedingly interesting objects connected with the activities of the Service, many of historical import.

The marked attention received by the exhibits from the Department of the Treasury was due not only to the importance of the subjects illustrated, but also to the fact that so many of them were "live" exhibits presenting constant action.

Exhibits of
The Department of the Treasury
at the
Sesquicentennial Exposition
1926

Introduction

Four branches of the Treasury were represented by exhibits at the Sesquicentennial Exposition. Two of these demonstrated the methods of the manufacture of money, a fundamental Treasury function, the Bureau of the Mint, the coinage, and the Bureau of Engraving and Printing the manufacture of paper money. The Public Health Service demonstrated the methods used for protection of the most important of all national assets, the public health; and the Coast Guard demonstrated the protection of life at sea.

Description of the Exhibits

Bureau of the Mint

The Bureau of the Mint Exhibits comprised replicas of pure gold and silver bars used in coinage, imitation gold, silver, nickel and bronze ingots, portions of the strips rolled from the ingots, and samples of the planchets before and after upsetting. With these items was a set of the finished coins.

The medal and bronze plaques of the Presidents of the United States, Secretaries of the Treasury, and other national characters shown in the exhibit were made in the engraving and medal departments of the U. S. Mint at Philadelphia.

Two coining presses were exhibited, one, a modern press, which was demonstrated in striking the official Sesquicentennial bronze and nickel medals; the other, an old screw press which, from the best record obtainable, was used for coinage of small coins as early as 1797. (Plate 15).

Vast improvements have been made in minting machinery since the establishment of the mint, and it is not difficult for the layman to note the improvements made in the modern coining press over the old one. The present day motor driven, automatically fed coining press strikes from 90 to 115 pieces of coin per minute, dependent upon the denomination of coin being struck. In all probability the old hand press would not strike more than half as many pieces in an hour's time as the modern press strikes in one minute.

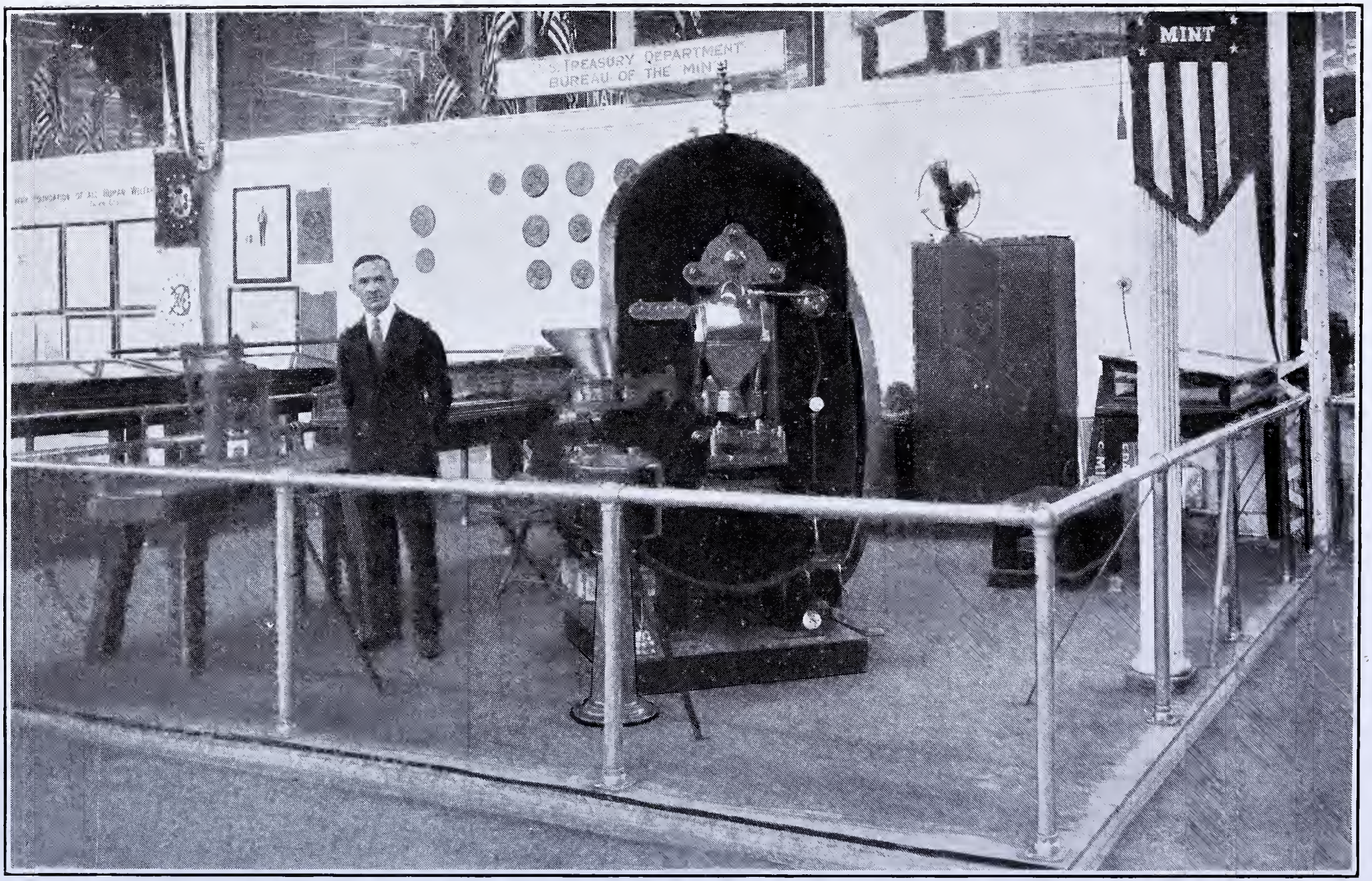

PLATE 15.—General view of Mint exhibit, showing (center) modern coining press electrically operated and (on left) the first press ever used to coin United States money. Edward B. Weaver, coiner in charge.

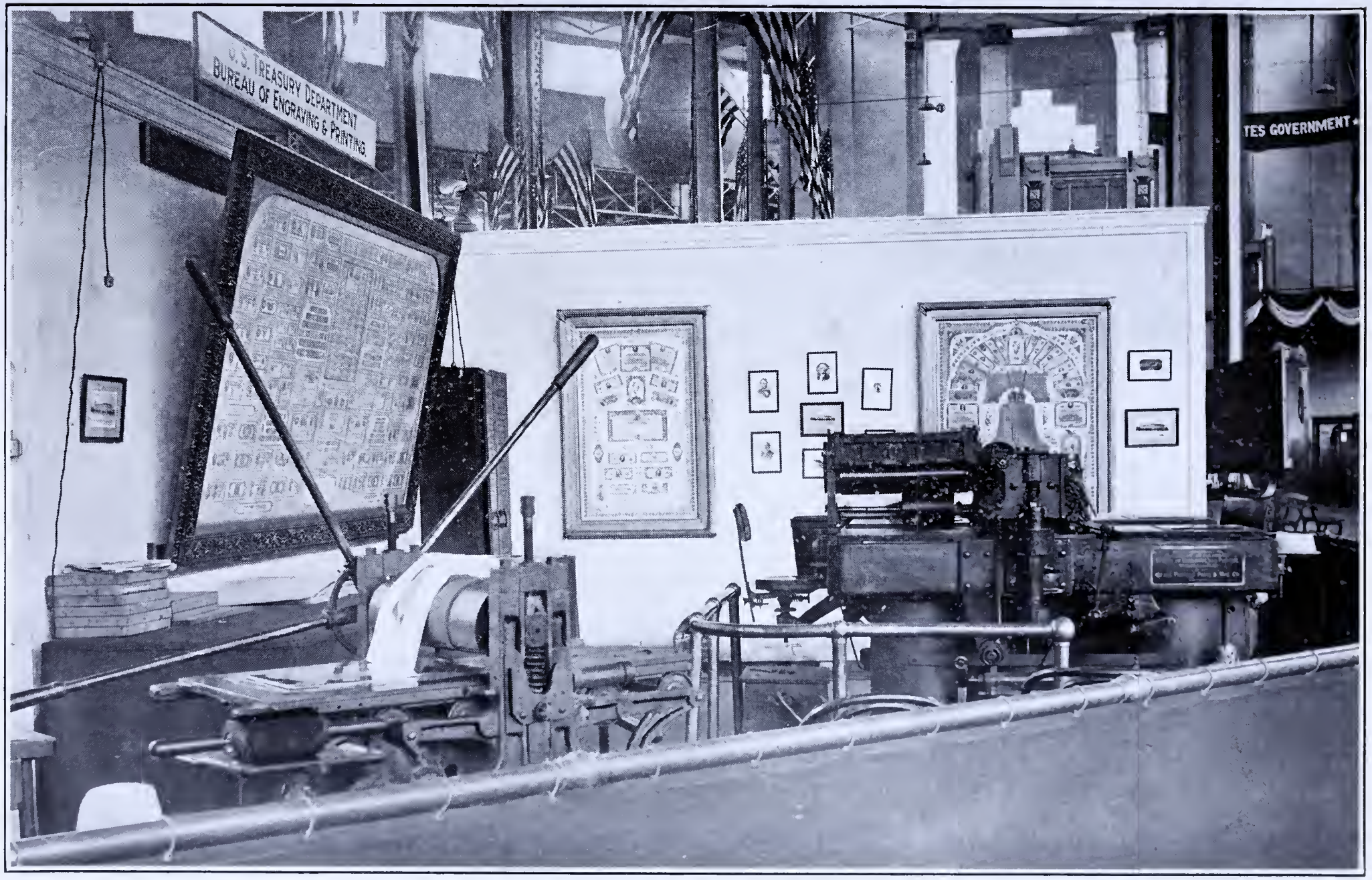

PLATE 16.—General view of Bureau of Engraving and Printing exhibit. In foreground the hand press for printing portraits and large bonds. At right Miehle power press. In background display of bank notes, postage stamps and other securities.

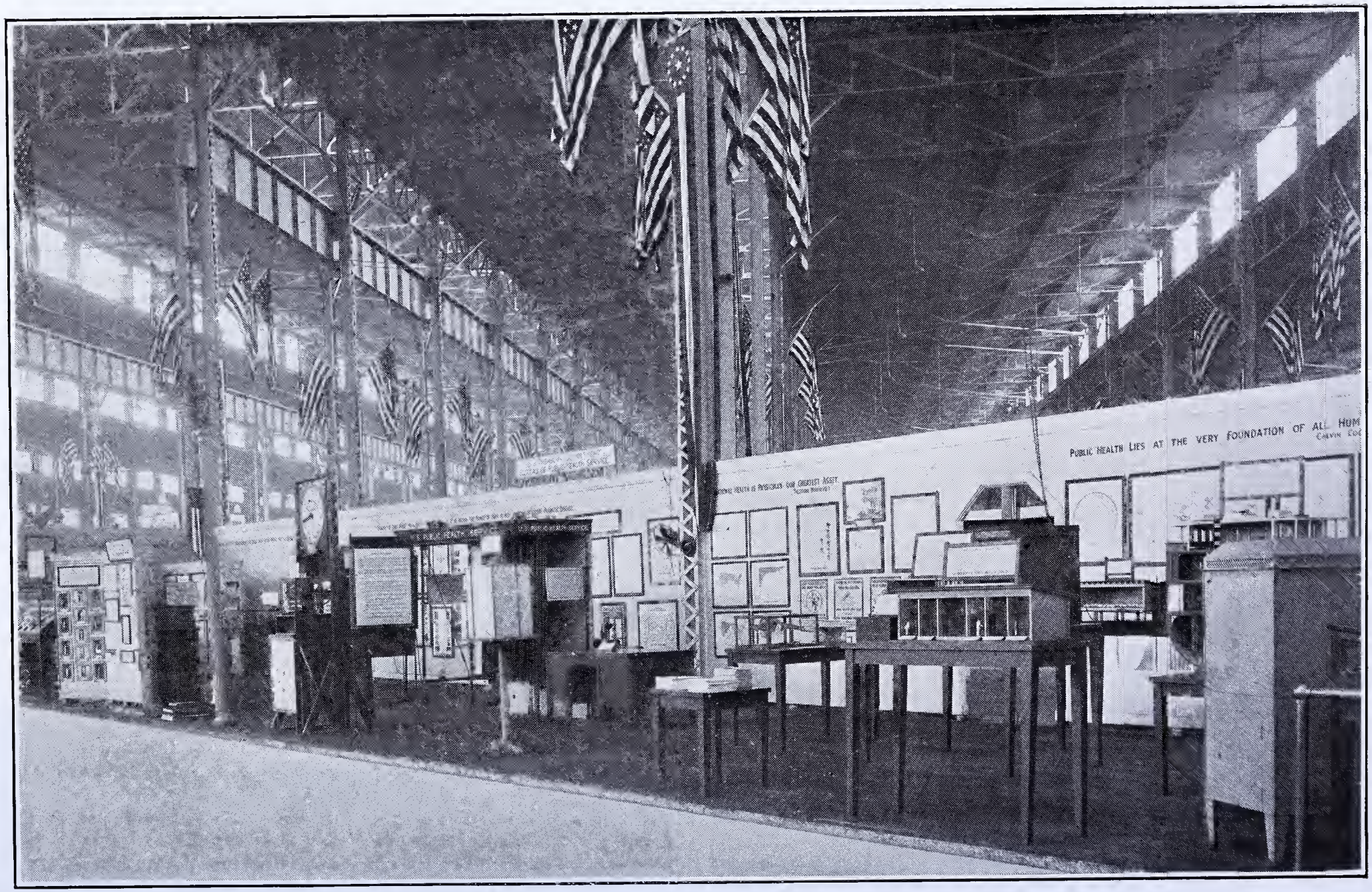

PLATE 17.—General view of Public Health Service exhibit.

The development in coining presses fairly represents the improvements made in all minting machinery since the Government Mint was established.

Bureau of Engraving and Printing

The exhibit of the Bureau of Engraving and Printing demonstrated the processes employed in the printing of currency, bonds, etc. It was recognized that a physical demonstration of the processes would provide the most effective means of showing the public how securities are printed by the Government.

Two types of printing presses were employed, one a small hand press of the usual flat-bed type, similar to those used in the printing of etchings and line engravings cut on steel or copper plates; the other a large press of the Miehle power plate printing type, like those in use in the Bureau. (Plate 16). This larger press accommodated four plates and was driven by electric power.

The plates used for demonstrating the exhibit were exactly like those used for printing currency and bonds in the Bureau, excepting the designs which were engraved especially for the purpose. The designs were made to represent an Eagle, the Liberty Bell, a Battleship, portraits of the Presidents, etc. No money designs nor securities of any description either in whole or in part, were printed at the Exposition.

Two expert plate printers and two plate printers' assistants operated the exhibit. In addition to the regular duties required in operating the presses, one of the printers gave lectures describing the processes employed in engraving and printing currency, postage stamps, bonds, revenue stamps and other work executed by the Bureau of Engraving and Printing. During the period of the lectures the other printer and the assistants were operating one of the printing presses.

United States Public Health Service

The Public Health Service aimed to show the present status of the work of the Service in preventing disease; the methods used by the Service for this purpose, and to give to the public pertinent data in regard to preventable diseases. (Plate 17). In order that the public might understand just what were the functions of the United States Public Health Service a bulletin board contained a statement showing the following data:

The United States Public Health Service, formerly called the United States Marine Hospital Service, was created in 1798. It is a Bureau of the Treasury Department and operates through seven divisions carrying on the following functions:

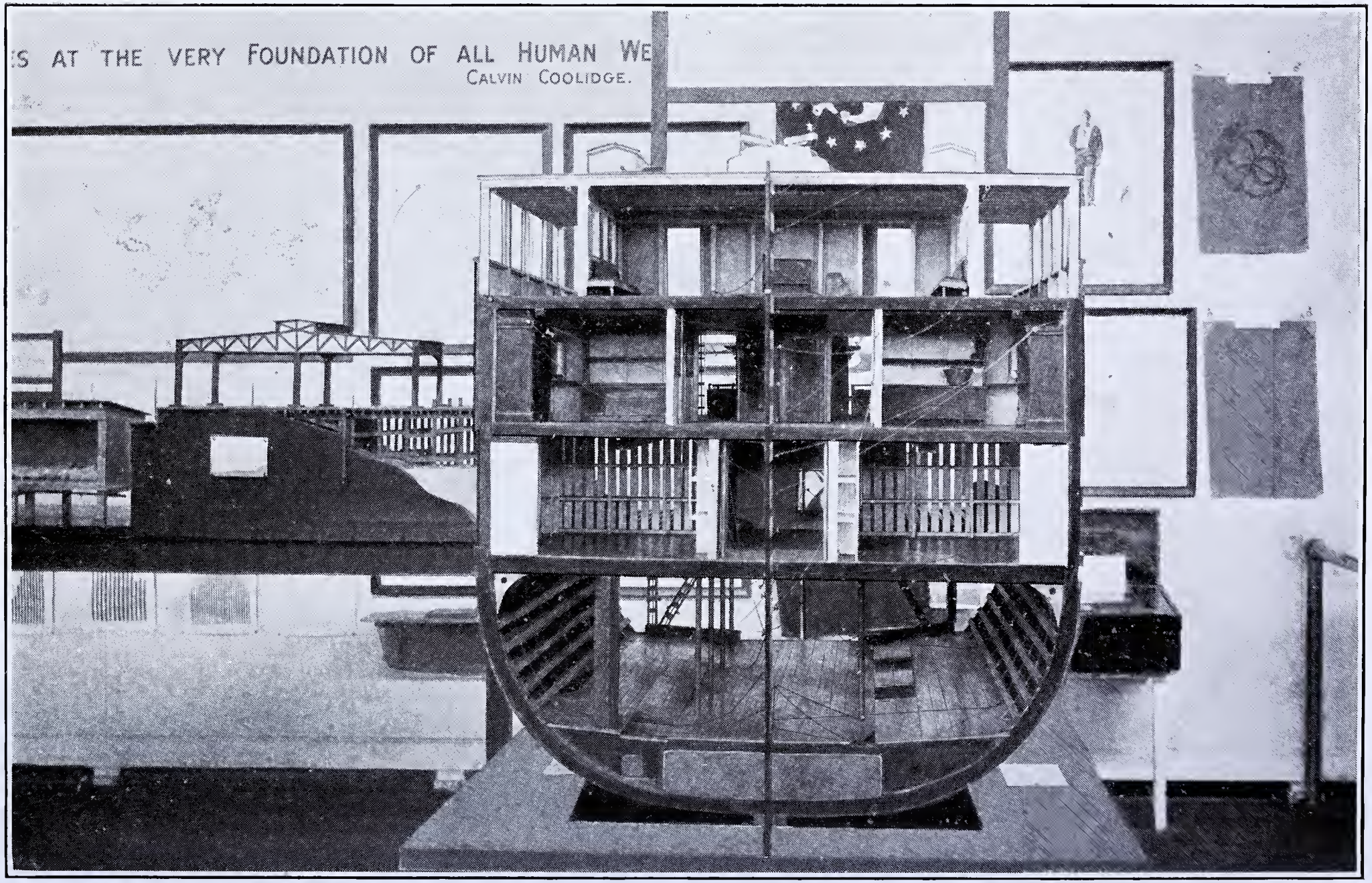

PLATE 18.—Model of ocean passenger liner in cross section, showing methods of rat proof construction.

Furnishing hospital service for the American Merchant Marine; injured government employees; personnel of the United States Coast Guard and other beneficiaries.

Protection of the United States from the introduction of disease from without.

Prevention of the interstate spread of disease and suppression of epidemics.

Cooperation with State and local boards of health in health matters.

Investigation of diseases of man.

Supervision and control of biological products.

Public Health education and dissemination of health information.

To graphically illustrate how these functions are carried on, and to impart health information to the public the following models were used:

Delousing Station.—A model of a building with miniature machinery and miniature human figures illustrating arriving aliens being deloused, the object of the procedure being to free from vermin all those found infested with body lice, as this insect transmits typhus fever. The miniature figures show the immigrant entering the building, disrobing, being bathed, having his clothing sterilized by steam, being inspected by a medical officer of the United States Public Health Service, and then leaving the building after dressing in his sterilized clothes.

Rat-proof Wharf.—A model showing methods whereby wharves and similar structures are made rat-proof. This is accomplished through the use of concrete or metal, or by construction methods which eliminate all closed harboring spaces for rats.

Rat-proof Grain Warehouse.—A model showing one method of construction and also a method of clearing a warehouse of such rats as might be carried in on freight, grain and similar material.

Rat-proof Ship.—A model of a cross section of an ocean liner showing construction methods whereby all rat run-ways and harboring places can be eliminated from a vessel. One-half of the vessel model showed the old method of encasing pipes; boxing-in shelving and similar construction details which offered rat harborage. (Plate 18).

Clinical Thermometer Disinfection.—A model showing how large numbers of clinical thermometers may be easily and quickly disinfected.

Sanitary and Insanitary Farms.—A model showing the contrast between two farm houses, outhouses, and surroundings. One had been arranged to protect health of the occupants and the other shows conditions which are insanitary.

Safe and Unsafe Well.—Two models, each being a cross section of a well, one being regarded as properly protected and the other as being unsafe. The advantage of having a safe well on a farm is to avoid

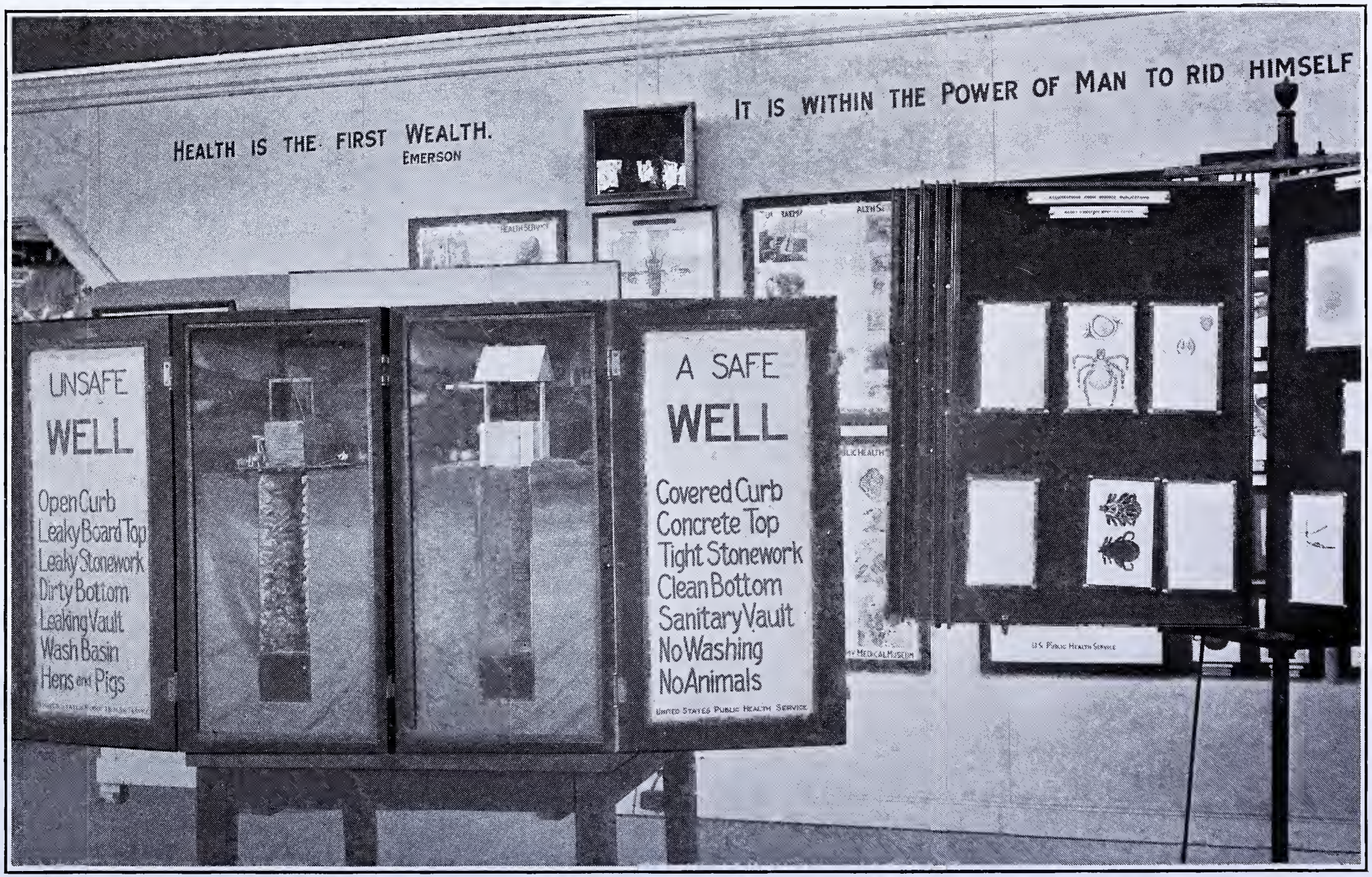

PLATE 19.—Models of safe and unsafe wells. Poster display of disease-carrying insects.

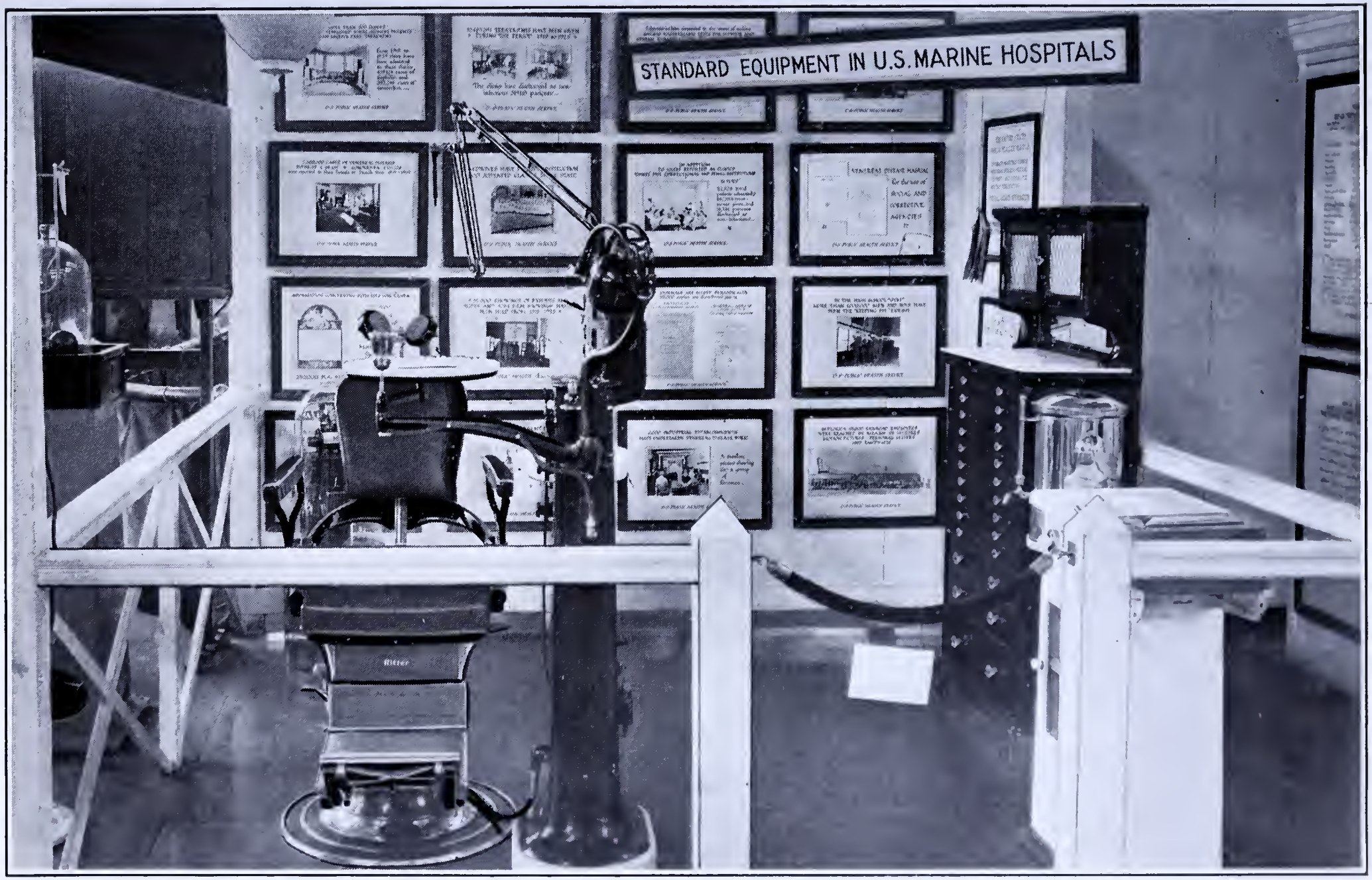

PLATE 20.—Standard dental equipment of United States Marine Hospitals.

the water-borne intestinal infections, principally typhoid fever. (Plate 19).

Mosquito Control.—To illustrate methods of mosquito control two large glass tanks containing water were placed on a table in the exhibit. One of these was kept supplied with eggs and larvae of mosquitoes. These larvae hatched out from time to time, but were unable to leave the tank on account of the mosquitoe screen cage over the tank. In the companion tank there were specimens of the small fish called *Gambusia affinis.* These fish feed on the eggs and larvae of mosquitoes and other acquatic forms of life. Alongside these two tanks were displayed enlarged models made of terra cotta showing the eggs of both *Anophelines* and *culex* mosquitoes, together with the larvae and pupae of these two kinds of mosquitoes. Appropriate literature was provided for those desiring to learn of the role of the mosquito in spreading malaria, yellow fever and dengue. A map was shown giving the geographic distribution of malaria in the United States. Other data manifested the economic loss due to malaria and the increased value of property that resulted from anti-mosquito work.

A Model School-room.—A model of a typical properly constructed classroom of a sanitary school was displayed. This school-room was built in accordance with the approved plans for school buildings.

Drinking Fountain.—Near the school-room model was placed an apparatus which showed a miniature figure of a little girl drinking from a modern bubbling fountain. While the observer looked at this figure it suddenly changed, being replaced by a bucket and dipper on a small table. A placard on this apparatus asked the question when the bucket and dipper were displayed: "Do you have this in your school?" This automatic apparatus was to emphasize the importance of the use of individual drinking cups or a bubbling fountain in schools to prevent the transmission of communicable diseases through the use of a common drinking cup.

Dental Display.—A complete display of modern dental equipment was arranged to show a dental operating room, and consisted of the standard equipment used in the Marine Hospitals of the United States Public Health Service. (Plate 20).

Physical Fitness Exhibit.—Interest in physical fitness was stimulated through the use of an apparatus to test physical strength. On a wall panel two discs that could be easily turned by an interested person were arranged. By setting marks on these two discs opposite lines drawn on the background the observer could find out his strength potential. This was done by setting the discs on the lines indicating his age and weight. When the right figures were obtained one could test

PLATE 21.—Daylight Recorder.

his strength by using a manuometer provided for the purpose, which recorded the number of pounds one could push or pull. For those who did not know their weight an automatic scale was provided. This scale also had an attachment for measuring the height of persons. Placards displayed with this apparatus emphasized the importance of an annual physical examination as a means of maintaining physical fitness.

Daylight Recorder.—An apparatus was installed in the exhibit which automatically registered the amount of sunlight on the roof of the exhibit building. This was done by having the appliance connected with a solonoid cell placed on the roof of the exhibit building. The amount of illumination was recorded on a continuous roll of paper in terms of foot candle power. An electrically lighted unit was shown with a power of 200 foot candles so that one might gain an idea of the value in illumination of the figures recorded on the pad. The amount of illumination was also indicated by a hand on a large clock-like disc marked off in foot candles instead of hours. Accompanying this apparatus was a chart emphasizing the value of light as a prevention for diseases (such as rickets). (Plate 21).

Illumination Values.—A model of a series of five living rooms was shown. These rooms were viewed through a small aperature in one wall of each room, similar to a stereoscope. The interior of each room was furnished, and the inside walls of each room were painted a different color, but each room was illuminated with the same volume of light from miniature electric bulbs. It was very noticeable that the colors of interior painting affected the amount of illumination available for work or reading.

Diseases in Industry.—A model showing a number of workmen about to enter a factory building. The model was arranged so that it appeared that one was standing within a building viewing this large group of people entering upon the day's employment. Just inside the window from which one viewed this group ten minature beds were placed, each bed containing a man or woman patient. Placards on each of the beds showed the number of persons in industry that are continually disabled from ten of the principal diseases of industrial workers. Other placards displayed with the model emphasized the value of modern industrial hygiene methods in increasing the efficiency, health and happiness of employees.

Prevalence of Disease at Various Age Periods.—The total amount of illness and the diseases most prevalent for each five-year age period was shown upon an octagonal apparatus. The data shown on the panels illustrated in a graphic manner the greater susceptibility to diseases of persons either very young or very old.

Seasonal Prevalence of Disease.—A slowly revolving cylinder twelve feet in circumference, on the surface of which were shown the twelve months of the year in parallel columns presenting in sequence the various seasons of the year. On this moving screen were shown the groups for seven common diseases. As the observer watched the cylinder revolving he could see how certain diseases increase during the winter and decrease during the summer and how other diseases take just the opposite course—increasing in summer and decreasing in winter.

Vaccination Models.—Modern methods of vaccination against smallpox were illustrated in a series of very life-like models. All of these models were displayed in a glass case accompanied by appropriate descriptive labels.

Venereal Diseases.—The effects of innocently acquired syphillis upon the exterior of the human body were shown by a series of life-like sections. This display of the ravages of syphillis was placed behind a screen on the outside of which was stated the nature of the exhibit.

Ship's Medicine Chest.—The standardized ship's medicine chest was displayed together with a first aid kit recommended by the Service for use at Coast Guard stations and similar locations. Other data in regard to the hospital work was shown upon appropriate posters and charts.

Service Publications.—The title pages of approximately 2,000 separate publications of the United States Public Health Service were displayed on wing panels. Accompanying the title pages of Service publications were hundreds of illustrations taken from these pamphlets.

Charts and Posters in Addition to the Charts and Posters Previously Mentioned.—All of the wall space of the exhibit was covered with other posters and charts illustrating the work being done by the United States Public Health Service. Some of the subjects covered by this series of charts and posters were: Tularemia, Rocky Mountain spotted fever, standardization of biologic products, drug addiction, goiter, trachoma, cancer, milk control, hookworm, mental hygiene, dental investigations and identifications of mosquitoes. In addition to the charts and posters on these subjects, in the case of certain subjects additional material was exhibited. In the case of hookworm a rack accompanied one of the posters containing several bottles of medicine used in the treatment of hookworm. With the mental hygiene charts there were shown five of the tests used to detect abnormal mental conditions. On the mosquito identification chart vials contained actual specimens of each variety of mosquito described on the chart.

PLATE 22.—View of office and reception room, Coast Guard Building.

Films and Slides.—The work of the Public Health Service was further illustrated by the use of film strips on various sanitary subjects projected with an automatic device. Films were also shown in the government projection room, various reels from the series "The Science of Life" being used. Lantern slides on health and sanitation were constantly shown with an automatic lantern slide projection device.

Distribution of Literature.—One pamphlet was especially prepared for the Sesquicentennial Exposition. Fifty thousand of these booklets were printed and judiciously distributed. The pamphlet was entitled: "The United States Public Health Service—What does it do for me?"

Coast Guard

The plans adopted for the Coast Guard Exhibit provided for the construction of an exhibit building with appurtenances, embodying the features of a typical Coast Guard station, and for the display therein of equipment, apparatus and machinery used in Service operations, and other representative paraphernalia including models, medals, decorations awarded to members of the Service, photographs, paintings, maps, etc. The Coast Guard Exhibit was officially placed in commission on July 3, 1926.

The personnel in charge of the Coast Guard Exhibit consisted of three warrant officers and twenty-one enlisted men.

The building, a feature exhibit in itself, was attractively located on the east bank of Edgewater Lake within the exposition grounds. It was 94 feet long by 52 feet wide and embodied the features of a typical Coast Guard Station. To provide moorings for life-saving boats, and a suitable space for visitors, a wharf 48 feet long by 11 feet wide was constructed and 75 yards out in the Lake was erected a drill pole, for use in connection with the breeches buoy lifesaving demonstrations. A launchway, providing for flying launches of the lifeboats, extended out from the building into the lake.

On the wall of the office directly in front of the visitor as he entered the exhibit building was a large oil painting vividly depicting a rescue of the crew of a shipwrecked vessel at sea, inviting attention to the paramount duty of the Coast Guard. Above the desk hung a large oil painting of the Coast Guard cutter *Bear* in the Arctic ice, considered the most historic vessel of the United States now in active service. (Plate 22).

On the walls of the exhibit room, which was 40 feet long by 20 feet wide, were a number of interesting oil paintings and charts, including the U. S. Coast Guard cutter *Hudson* rescuing the disabled torpedo boat *Winslow* from under the batteries at Cardenas, May

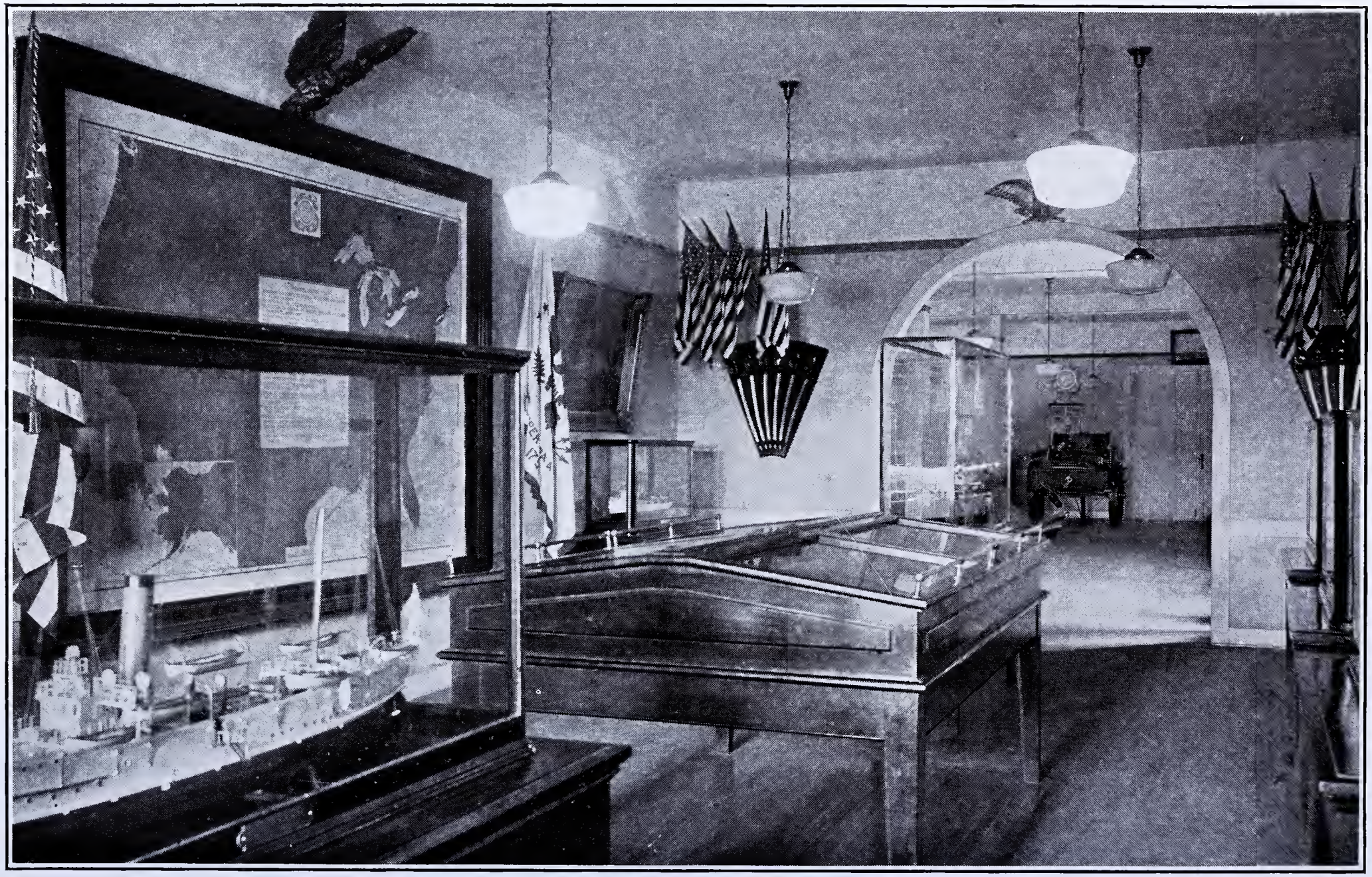

PLATE 23.—Sectional view of exhibit room, Coast Guard Building.

11, 1898; the capture of the French privateer *Mehitable* and her prize, the ship *Nancy* by the U. S. Coast Guard cutter *Eagle*, May 9, 1799; and the U. S. Coast Guard cutter assisting a vessel in distress and effecting a rescue at sea. The feature object in this room was a large and handsomely framed colored map upon which were shown the location of the Coast Guard stations, vessels, and the organization of the service. (Plate 23).

These paintings held the attention of the visitor, and reminded him of the Coast Guard's participation in both the peace and war activities of the Nation. Models of Coast Guard cutters, both old and modern types, were installed in suitable spaces about the room, affording one a minute and close-up inspection of the Coast Guard craft which have made enviable records in humanitarian and public service and have earned distinction in the wars in which the United States has been engaged.

A large display cabinet, occupied the center of the Exhibit Room, and in it were many priceless testimonials and awards by our Nation and foreign governments and organizations in recognition of heroic deeds and accomplishments of Service personnel, and a number of historic documents associated with the history of the Coast Guard. It is of interest to mention the following objects in this collection:

Gold inlaid sword awarded by the British Government to Commander D. F. A. Tozier, U. S. Coast Guard, as a token of their cordial thanks for the valuable assistance rendered by him during the search for H. M. S. *Condor* along the west coast of Vancouver Island, February, 1902.

Gold and Silver Life-Saving Medals of Honor, awarded under Act of Congress to any persons who shall endanger their own lives in saving or endeavoring to save lives from perils of the sea.

Cardenas Medal of Honor, awarded by Act of Congress in recognition of the intrepid and heroic gallantry of the officers and men of the Coast Guard cutter *Hudson* at Cardenas, Cuba, May 11, 1898.

Alaskan Overland Expedition Medal, awarded by Act of Congress to certain Coast Guard officers for heroic services rendered the whaling fleet caught in the Arctic ice, 1897-98.

Distinguished Service Medal, awarded pursuant to Act of Congress to several Coast Guard officers for services during the World War.

British Distinguished Flying Cross, awarded by the British Government to Lieut. Commander E. F. Stone, U. S. Coast Guard,

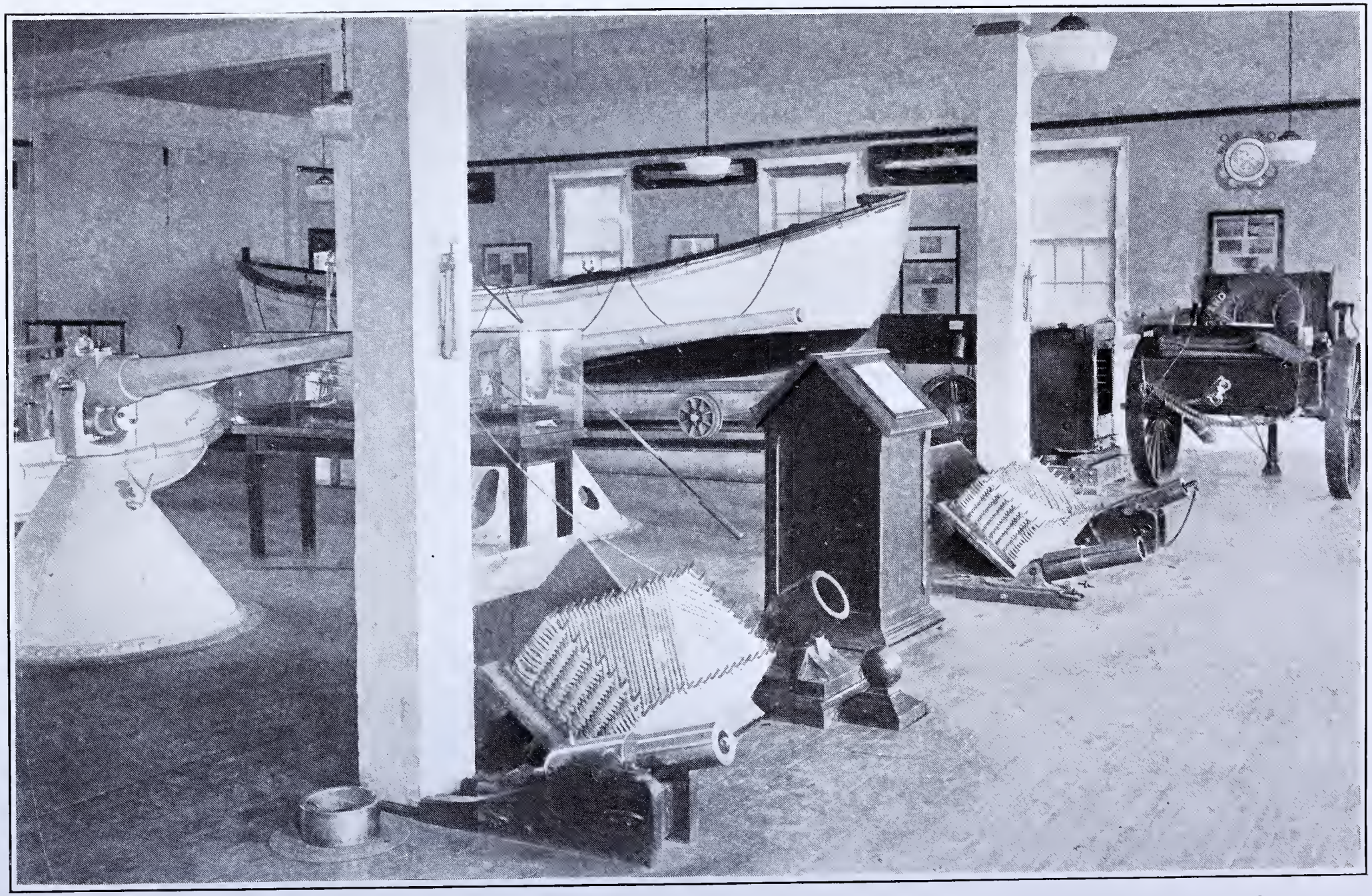

PLATE 24.—Sectional view of Coast Guard boat room. On pedestal is mounted the historical "Tampa" boat plate.

a pilot of the U. S. seaplane NC-4 on the first trans-Atlantic flight.

French Medal of Honor, awarded to Commander D. F. Tozier, U. S. Coast Guard, in recognition of his gallant, courageous, and efficient services in saving the French bark *Peabody* aground February 23, 1877, off Horn Island, Mississippi Sound, Gulf of Mexico.

Italian Medal of Honor awarded by the Italian Government to the Sandy Hook Coast Guard Station, N. J., for distinguished service in saving the crew of the Italian ship *Umberto I* which stranded off Sandy Hook on March 13, 1891.

Belgium Civic Cross awarded to certain Coast Guard personnel by the King of the Belgians.

British Medal of Honor, awarded by the British Government to certain Coast Guard personnel in recognition of their gallantry in rescuing from "a sea on fire" the 42 members of the British oil tanker *Mirlo* sunk by an enemy submarine off the North Carolina coast on August 16, 1918.

Testimonial in the form of gold cigarette case with diamond setting, presented by the Czar of Russia to Captain O. C. Hamlet, U. S. Coast Guard, in recognition of his conspicuous service in the cause of humanity to the people of Siberia while in command of the Coast Guard cutter *Bear*.

Decorations from foreign governments to Coast Guard personnel for services during the World War.

Collection of United States medals and awards issued to Coast Guard personnel for services during the wars in which the Coast Guard participated.

Commission issued by President Washington to Captain Hopley Yeaton, U. S. Coast Guard, being the first commission issued to an officer afloat.

Famous message of Secretary of the Treasury Dix, "If any man attempts to haul down the U. S. flag, etc."

Panel groups of colored photographs of Service activities, stations, ships, etc., were placed in the unoccupied spaces on the wall, and decorations of flags, and shields gave a pleasing finishing touch to the Exhibit Room with its wealth of educational objects pertaining to the history, duties, resources, and accomplishments of the Coast Guard.

The boat room which was 51 by 54 feet, comes next. (Plate 24). In the center of this room, mounted on a pedestal, was the boat plate of the ill-fated Coast Guard cutter *Tampa* which was sunk on September 26, 1918, in the Bristol Channel, by an enemy submarine, with

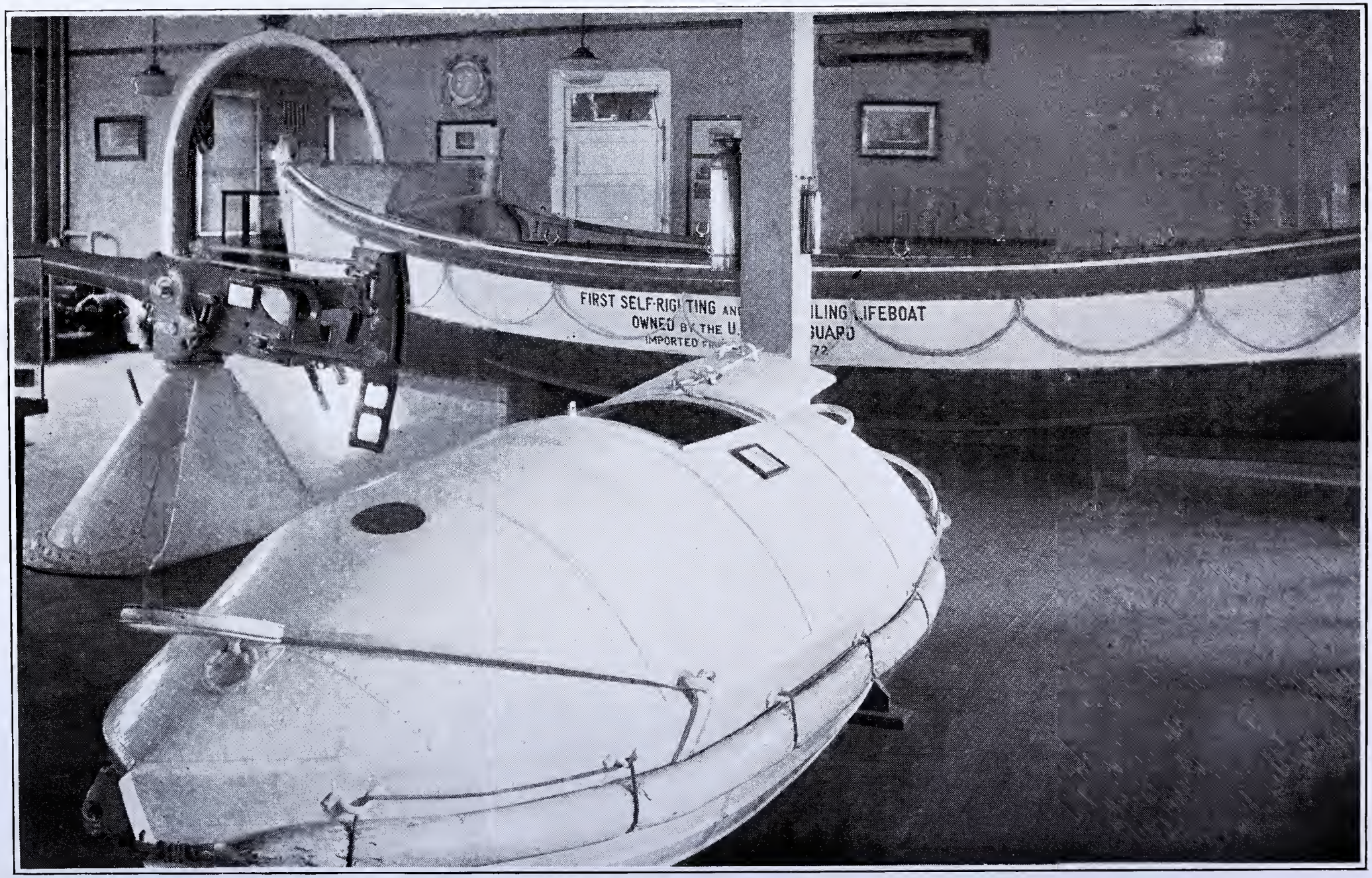

PLATE 25.—Sectional view of Coast Guard boat room. In back ground self-righting life boat.

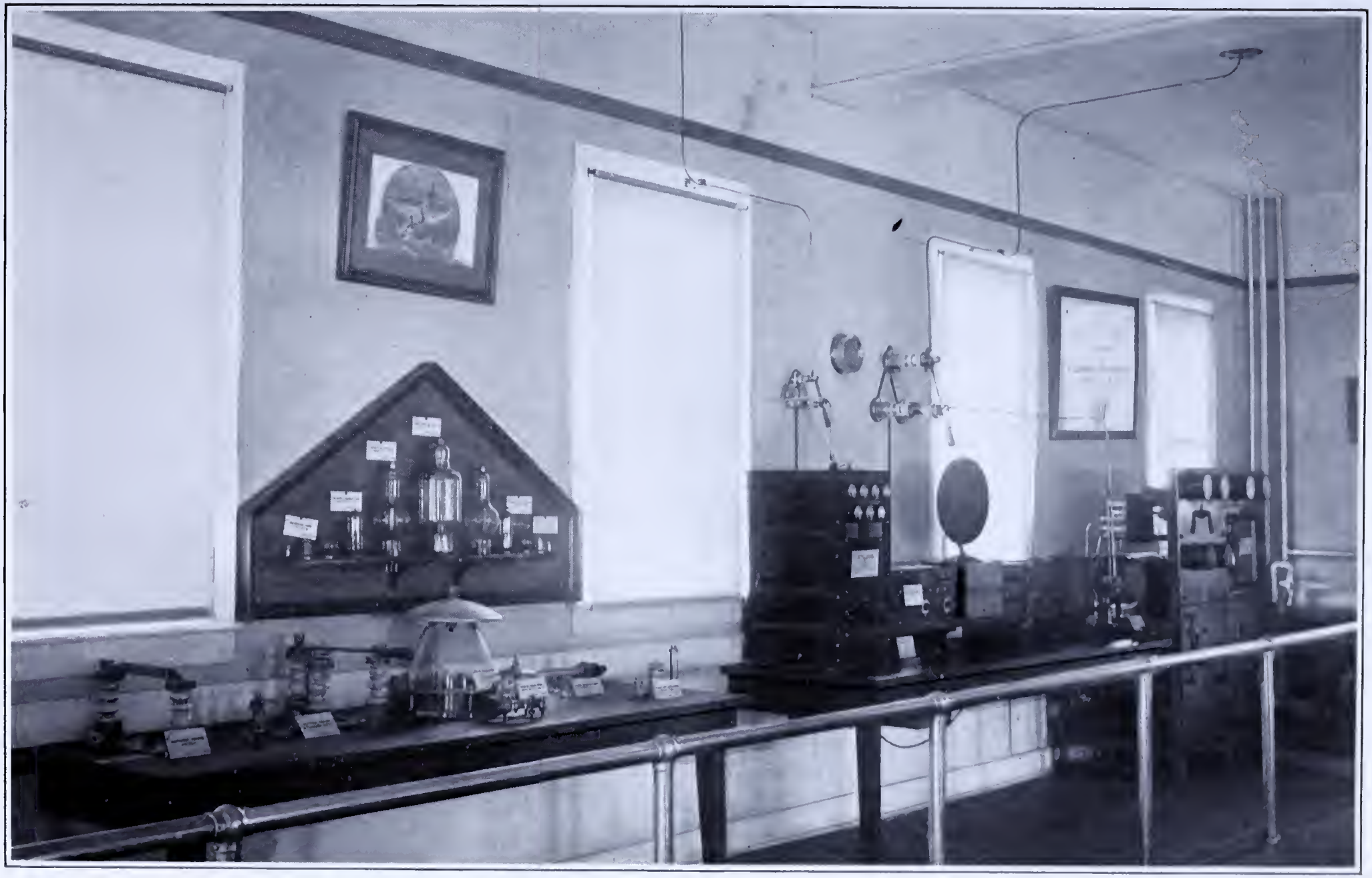

PLATE 26.—Sectional view of Coast Guard boat room showing radio display.

the loss of every soul on board—115 in all—being, with one exception, the largest individual loss sustained by our naval forces during the World War. This boat plate was the only recovered part of the *Tampa* and constitutes one of the most treasured World War mementos of the United States. On one side of the room was placed the first self-bailing, self-righting lifeboat, imported from England in 1872 and now owned by the United States Coast Guard. (Plate 25). On the opposite side of the room, resting on the launchway and ready for instant launching into the Lake, was a modern type of self-bailing, self-righting pulling surfboat, such as forms a part of the regular equipment of a Coast Guard station. The old and new types of mortars used in shooting lines to vessels in distress were shown side by side, including the one from which was fired the first projectile in the United States to save the lives of the crew of a vessel in distress, the instance being that of the British ship *Ayrshire* stranded off Squan Beach, New Jersey, on January 12, 1850. A shoulder line-throwing gun, the smallest type of ordnance used for establishing line communication with a vessel in distress, was mounted near two six-pounder guns, the largest type of ordnance employed for such a purpose, using the Camden projectile. In racks alongside the wall were displayed a number of projectiles used in saving life from famous wrecks. Night signalling sets, beach lights for illuminating the scenes of wrecks, beach apparatus gear and cart for use at wrecks, lifecars, and other equipment peculiar to the life-saving activities of the Coast Guard, afforded the visitor an intelligent idea of these implements. A working model showing how the breeches buoy apparatus operates between shore and a wrecked vessel, inclosed in a glass cabinet, proved an interesting attraction.

An elaborate and interesting display of radio apparatus and appurtenances, from the small short wave sets installed on patrol boats for both voice and code communication to the largest types forming a part of the equipment of the International Ice Patrol Coast Guard cutters, acquainted visitors with the advanced and efficient methods of the service in radio and telephonic communications. (Plate 26).

A Sterling-Coast Guard Engine of the type used in the 75-foot patrol boats, a panel group of photographs of the machinery of the most modern type of cutter, and a working model (electrically operated) of a triple-expansion engine were conveniently placed for inspection of those interested in machinery, and close by was a model of one of the 75-foot patrol boats.

Rifles with highly polished bayonets placed in racks reminded the visitor that the Coast Guard is a part of the military forces of the Nation. High up on the walls and spaced at intervals completely

PLATE 27.—Side view of Coast Guard Building showing the surf boat on the launching carriage and the breeches buoy apparatus cart on the rear runway.

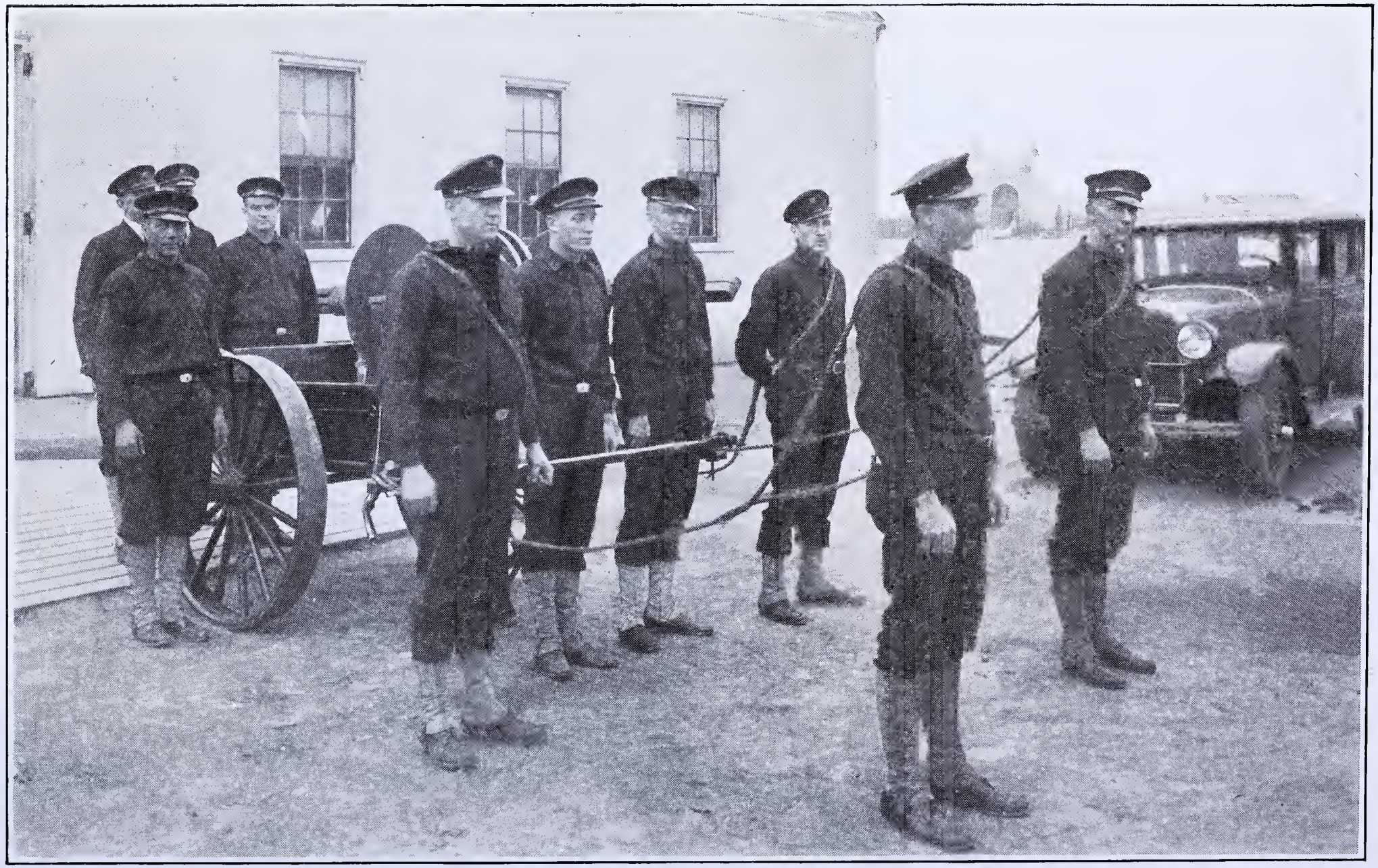

PLATE 28.—Crew at their positions ready for the breeches buoy drill.

PLATE 29.—The breeches buoy drill.

around, were half-models of various types of Coast Guard boats and cutters, and below these hung various paintings, panel groups of colored photographs relating to the Service, and descriptions of the various types of uniforms and markings worn by the personnel of the Coast Guard. A stereopticon machine and an automatic motion picture projector showing scenes of the Service at work in its various fields of endeavor completed the collection of objects on exhibit in the boat room.

The second floor of the exhibit building was reserved for quarters for the warrant officers and enlisted men assigned to the exhibit, and was also used for a storeroom for miscellaneous supplies.

At the rear of the building were signs directing visitors to the lifeboats at the wharf adjoining the station building. Here were moored the 36-foot self-righting, self-bailing motor lifeboat, representing the most modern agency of this character for saving life at sea, and the 36-foot self-righting and self-bailing power surfboat which is capable of being launched into the sea from the beach. Both boats were open to inspection, and visitors were permitted to go aboard them.

Outdoor Drills

One of the most interesting attractions at the Exposition were the life-saving, resuscitation and capsize drills given by the Coast Guard, demonstrating the methods employed by the Service in saving life at sea, the expert manner in which the personnel are trained in handling boats, and in resuscitating the apparently drowned. These drills were given daily, except Sunday, at 2.30 p. m., and on Saturdays at 10.00 a. m. A loud-speaker system was installed, and a lecturer stationed in the lookout tower with a clear view of all activities, would explain in detail the various evolutions of the drills as they took place and their relation to the work of the Coast Guard.

It was customary first to give the breeches buoy drill, the men taking their positions upon the sound of the alarm and rushing to the assistance of an imaginary shipwrecked vessel which was represented by the drill pole erected in the lake. (Plates 27, 28 and 29). With constant precision the line would be shot across the mast of the imaginary ship by means of the line-throwing gun, the breeches buoy apparatus set in place, and the rescue of the men aboard the shipwrecked vessel effected. The performance of these drills never failed to win the praise of the onlookers.

PLATE 30.—The flying launch.

Following the breeches buoy apparatus drill the station crew would demonstrate the flying launch (Plate 30) and give boat drills. After taking their positions in the pulling surfboat in the Exhibit Building, the boat would be released, and with a surprising swiftness would glide down the launchway and into the water where the various evolutions in the handling and maneuvering of boats would be given.

The resuscitation drill took place next. To attract attention of the public, a member of the station crew, previously stationed in a small boat out in the lake, would fall overboard and call for help. Responding to his cries the boat crew would pull to the rescue and one of their number would dive overboard and bring him to the surface. Taking the apparently drowned man into their boat, they would carry him with all speed to the wharf where he would be resuscitated, the operation being explained through the loud-speaker system.

The capsize drill showing the complete turning over of a surfboat, the crew going under the boat and into the water and then righting it, completed the program of outdoor drills.

THE DEPARTMENT OF WAR

THE DEPARTMENT OF WAR

Foreword

The War Department made a truly live exhibit with its 55 officers, 1,000 men, 225 horses and 44 mules. There were detachments of infantry, field artillery, cavalry, air service, a heavy ordnance company, a medical detachment, a platoon of light tanks and one heavy tank, each with its distinctive uniforms and equipment. Camp Anthony Wayne was a busy place from early dawn until late afternoon, and not infrequently far into the evening, always creating in the minds of visitors a favorable impression whether at drill, on guard duty, air corps demonstrations, tank displays, firing salutes, or in ceremonial and dress parades.

Other duties included escorts of honor from the Liberty Bell and Independence Square to the Camp far within the exposition grounds. The Army participated in many special events and demonstrations frequently given by the Exposition authorities or by prominent visiting organizations. They took part in the opening day exercises on May 31st, the visit of the President of the United States, the receptions given to the Queen of Roumania, the review for the Crown Prince of Sweden; Government Day, September 14th; Constitution Day, September 18th, and in many other notable events.

The excellent appearance and splendid bearing, the courtesy of both officers and men at all times and upon all occasions, was remarked by every one. As a Government exhibit, the United States Army stood out as a leading attraction, and one that played a very conspicuous and important role in the activities of the Sesquicentennial Exposition.

Exhibits of the Department of War
at the
Sesquicentennial Exposition
1 9 2 6

Introduction

As early as December, 1925, plans were being made for a War Department participation in the Sesquicentennial International Exposition. Congress appropriated $250,000 for the maintenance of this exhibit. The Commanding General, 3d Corps Area, recommended that the Army's participation consist of a detachment of troops for duty at the Exposition during its continuance. This plan was approved by the War Department and Camp Anthony Wayne was established. (Plate 31).

Description of the Exhibits

The troops selected were designated as the Sesquicentennial Exposition Force, and Colonel Joseph W. Beacham, Jr., 12th Infantry, was named as their leader. The troops consisted of the following units:

Headquarters and Headquarters Company, 12th Infantry
Service Company, 12th Infantry
Third Battalion, 12th Infantry
Composite Air Corps Squadron
Battery "C," 6th Field Artillery
Troop "G," 3d Cavalry
First Platoon, 8th Tank Company
Medical Detachment
Veterinary Detachment
Ordnance Detachment
Quartermaster Detachment

These troops were given a dual mission—first, to do all in their power to make the Exposition a success; second, to present to the general public, a favorable impression of the Regular Army. With this end in view, all organizations made extensive preparations to obtain new and superior clothing and equipment, and to so train themselves, that, before arrival at the Exposition, they would be perfect in close order drills and ceremonies.

A camp site in the southwestern portion of the Exposition Grounds was selected to house the United States troops as it was the only place available.

PLATE 31.—View of Camp Anthony Wayne looking south. United States Coast Guard Building in foreground.

The buildings erected and other construction work needed to make the camp a model one are given below:

Headquarters Building and Officers' Mess
Kitchens and Mess Halls for the enlisted men
Stables and Storage Sheds
Latrines
Dispensary
Post Exchange
Service Club for enlisted men
Tents for Senior and Junior Officers and enlisted men and one Shop Tent, numbering altogether 293.

The tents were all framed, walled, floored and screened—the buildings were all screened and electric lighted.

There was a complete telephone service with Camp exchange. Also water and sewerage installation.

Two macadam roads extending across the Camp were also built by Sesquicentennial authorities.

No grading was required on the Camp Site, but it was necessary to pave the corrals surrounding the stables, with cinders from 8″ to 16″ deep.

When cold weather set in, that portion of all Mess Halls that was inclosed with wire screening only, was covered with heavy roofing paper. All doors were similarly covered, and windows were installed.

Sibley Stoves, regular Army equipment, were installed in tents, and required number of heating stoves were installed in the various buildings.

Few people realize the vast amount of work required to bring such a camp to a successful completion, justifying the name of a "Model Army Camp." However, the feat was accomplished and the Camp, when opened to the public, received the highest praise from all who took advantage of the opportunity to wander through its grounds.

The Commanding General, 3d Corps Area, on May 18th, designated this camp as Camp Anthony Wayne, in commemoration of that distinguished Pennsylvanian, the hero of Stony Point, Ticonderoga, Brandywine, Germantown and Monmouth, a soldier whose military genius and exploits won for him the Nation's gratitude.

Another task was the clothing and equipping of the troops. New model uniforms, tailor made of experimental serge for officers uniforms, Pershing caps, white shirts and collars were procured. This, with

superior leather equipment, enabled the men to make an excellent appearance on all occasions of ceremony and also when on pass. One of the best military tailors in the country was secured to measure and make from a special cloth, the uniforms of the officers of the Sesquicentennial Exposition Force.

The first unit to arrive was an advance detachment of the 12th Infantry from Fort Howard, Maryland, on May 26th. Before the opening of the Exposition on May 31st, practically all units had arrived.

During the month of July, Brigadier General Henry G. Learnard was ordered to Camp Anthony Wayne, and on the 19th of July, assumed command of the Sesquicentennial Exposition Force, and remained until the close of the Exposition on November 30th, 1926.

A program of training for the command was published on May 29th. To show the general mission, training, methods and standards required extracts of a few paragraphs are quoted:

"*I—General*:

2. Organizations will be perfected in close order and extended order drills and ceremonies; and will be capable of demonstrating the different phases of combat, in so far as applicable to the unit concerned.

3. Organizations will be prepared to stand inspections, turn out for parades, reviews, escorts and guards of honor, to hold formal guard mounting and to carry on such exhibitions and demonstrations as will come under the scope of their particular arm. Further, they will be prepared to carry on such tactical exercises as may be required for the purposes of demonstration.

4. It is a part of our mission to present to the general public, a favorable impression of the regular army, hence, every drill, every ceremony, every exhibition and demonstration must be of the highest standard.

5. Each and every individual will maintain at all times, cordial relations and offer fullest cooperation with the civilian authorities.

"*II—Training, Methods and Standards*:

2. Standards of proficiency will be insisted upon as follows:

a. Presentation of a smart appearance at drills and ceremonies by all organizations; a superior condition of the uniform and equipment, and precision and accurancy in execution of details.

b. The attainment by all men of a thorough understanding and automatic execution of all phases of military courtesy.

"*III—Inspections*:

1. Frequent inspections will be made by all commanders with a view to correcting any delinquencies in the execution of existing orders and regulations. Great care will be given to personal appearance of officers and men and of condition of arms and equipment."

The regular routine drills of the command during the morning hours consisted of calisthenics, close order drill, formal guard mounting three days a week, Butts Manual five days per week, with music added, three days per week, and demonstration by the Air Corps. The Ordnance Maintenance Detachment and the Tanks were on display both morning and afternoon. On Tuesday and Thursday afternoons, at 4.00 p. m., a parade and review, including all arms of the service, was presented to the public. This included the following organizations, passing in review in the order designated:

12th Infantry Band
3d Battalion, 12th Infantry
1st Platoon, 8th Tank Company
Battery "C," 6th Field Artillery
Troop "G," 3d Cavalry
Composite Air Corps Squadron

The Air Corps, in flying formation, presented a beautiful picture as it passed in review. The above was followed by an aerial demonstration, and exhibition drills by the following organizations:

Company "L," 12th Infantry
Battery "C," 6th Field Artillery
Troop "G," 3rd Cavalry

This program covered about one hour.

However, the above consumed only a portion of the time. It was the escorts of honor, salutes and reviews for distinguished visitors and programs for special occasions that proved to be the real mission. From the ceremonies on opening day, May 31st, till the close of the Exposition, November 30th, programs for turning out were both frequent and interesting. The ceremonies were varied in nature, consisting of parades from 20th Street and Parkway, south on Broad Street through the Exposition grounds and terminating at the Stadium; Escorts of Honor from the Liberty Bell to various points in camp; ceremonies in the Forum of Founders; ceremonies at Camp Anthony Wayne; ceremonies and dedication of many buildings about the Exposition Grounds. A great many of these distinguished visitors during their official tour of the grounds, honored Camp Anthony Wayne with their

PLATE 32.—Parade at Camp Anthony Wayne, June 10, 1926.

PLATE 33.—Dedication of the Czecho-Slovak Building.

PLATE 34.—Parade on Pan American Day, October 22, 1926.

presence and were tendered a review and drills, depending upon the length of time they could spare at the Camp.

Among the distinguished personages entertained at Camp Anthony Wayne, were members of European Royal families, members of the Cabinet, ambassadors and ministers from foreign countries, governors of various states, generals of the Army and admirals of the Navy.

There were many more than one hundred ceremonial parades and escorts of honor for distinguished visitors and special occasions. (Plates 32 and 33).

Among the highlights of the programs in which the Army participated was Opening Day Exercises, May 31st; review for the Crown Prince of Sweden, June 2; Flag Day Exercises, June 14th; exercises at Valley Forge, June 15; the visit of the President of the United States, July 5th; Government Day, September 14th; Constitution Day, September 18th; Army Day Program for the benefit of the American Legion, October 13th; Pan American Day, October 22nd (Plate 34); Armistice Day Program, November 11th; and Commemoration Day Exercises, November 30th.

On June 24th and 27th, the Army participated in the pageant, "America," in the Municipal Stadium, given under the auspices of the Philadelphia Music League. Besides playing an important role in three events, Troop "G," 3d Cavalry, gave an exhibition drill. This was followed by a demonstration of an attack by an Infantry Platoon with attack weapons. These features were witnessed by at least 100,000 people on June 27th.

On October 13th, a pageant, depicting scenes from the American Revolution was presented by the troops to the American Legion, in the Municipal Stadium. The opening number was Paul Revere's ride, followed by the Battle of Lexington, the Signing of the Declaration of Independence, a review of Washington's Army at Valley Forge. This was followed by a stirring battle scene from the World War, in which practically every branch of the service was represented. This demonstration, witnessed by thousands, brought back vivid pictures of the recent war and was, without a doubt, the most thrilling event during the Exposition.

Along with the military duties, many prominent people, both civil and military, were entertained at Camp Anthony Wayne. An evening parade followed by exhibition drills, in turn followed by a "Tea Dansant" was held once or twice a week.

During the month of September, the United States Army Band from Washington, D. C., was an added attraction with the United States Troops. Outside of functioning with the troops, concerts were played

for the benefit of the public at the Sesquicentennial Auditorium, Forum of Founders and High Street in the Exposition Grounds.

The Model Army Camp, with its clean streets, well conducted ceremonies, and evening parades, was one of the outstanding attractions of the Exposition, and no visitor to the grounds felt that a tour was complete without witnessing some of the many features of the camp. However, it might be well to mention that along with other attractions of the Exposition, the troops were greatly handicapped by very unfavorable weather conditions throughout the summer. The parade ground, low and difficult to drain, was on many occasions a source of disappointment. It was necessary quite often to cancel some of the demonstrations which were looked upon with pride, or substitute another of lesser importance, due to the parade ground being covered with mire. Notwithstanding the many obstacles that presented themselves, the tour of duty as a whole was very successful.

It is felt that the mission of the United States Troops at the Sesquicentennial Exposition was well fulfilled. The officers and men of the command labored as one to accomplish the purpose for which they were ordered to the Exposition. The high standard of drills and ceremonies exhibited by the Sesquicentennial Exposition Force made a very favorable impression upon all visitors and the general public. The uniformly courteous and friendly relations established has made new friends for the Army.

The exceptional behavior of the enlisted personnel, whether in camp or on pass, exemplifies the excellent discipline maintained by organization commanders. Only the highest praise is due all members of this command.

The many calls for the function of this Force clearly demonstrated the important cog the United States Troops played in the role of the Sesquicentennial Exposition. The troops left with a feeling of pride in a duty well performed, and of having aided materially in the success of the Exposition.

THE POST OFFICE DEPARTMENT

THE POST OFFICE DEPARTMENT

Foreword

The location of the Model Post Office between the Palace of Liberal Arts and the Palace of Agriculture was selected because of its convenience as an operating branch, and it is gratifying to note that it was among the first of the Government exhibits that was completely ready for business and public inspection some days before the official opening of the Exposition on May 31, 1926. The volume of its business in the sale of stamps, money orders, and mail handled—demonstration features of the exhibit—proclaimed its popularity and well deserved appreciation.

The Post Office Department exhibit, which, in addition to its Model Post Office, contained many objects of great practical importance, interesting to everyone. These were all treated in detail, and the descriptions on the labels of subjects relating to the prevention of the sale of worthless medicines, suppressing bandits and capturing mail robbers, were not only full of interest, but also often quite thrilling. The work done by the Inspection Service in suppressing frauds and in bringing malefactors to justice has been strikingly efficient and most beneficial in its results. Losses arising from improperly addressed letters or carelessly wrapped packages for mailing is surprisingly large as shown in the exhibit from the Dead Letter Office.

The feature exhibits were those of the Model Post Office, the Postal Railway Mail Service and the Airplane Mail Service, each exceedingly well presented and attractive.

The development in post office equipment and the remarkable progress in the organization of this service made to meet the demands of a rapidly increasing population and expanding commerce were admirably brought out in the exhibit.

Exhibits of the Post Office Department
at the
Sesquicentennial Exposition
1926

Introduction

The Model Post Office building contained 18,000 square feet of space; 5,800 square feet were used for the Model Post Office proper and 9,500 square feet for lobby and exhibits. In putting up the Department's exhibit, it was decided to have a Model Post Office, thereby enabling the Department to furnish adequate postal service to the exhibitors and the public attending the Exposition. In addition to the service feature, it was also decided that the Department's exhibits would be of such a character as to impress upon the public the ramifications and magnitude of the postal service.

The Department's exhibit received much publicity. It was crowded at all times with interested visitors. The Postmaster and Railway Service officials at Philadelphia showed great interest in the exhibit, and their zealous cooperation was most helpful in making it a success. The exhibit was opened on May 25, 1926, and was the first Government exhibit completed.

The volume of postal business transacted at the Model Post Office and also the stamp sales at the Railway Mail Service exhibit, which was located in the Transportation Building, is shown by the following figures:

> Stamps sold at the Railway Mail Car and the Model Post Office amounted to $60,458.68, or, including meter mail, $72,968.68. Domestic Money Orders were issued amounting to $110,866.16; fees $655.08. International Money Orders were issued amounting to $10,861.75; fees $118.30. Postal Savings were received to the amount of $7,416.30, and paid to the amount of $3,616.00. There were also 5,748 Registered Letters; 4,036 C. O. D. Packages; and 7,629 Insured Parcel Post Packages.

Description of the Exhibits

The following exhibits were displayed within the Model Post Office Building. (Plate 55).

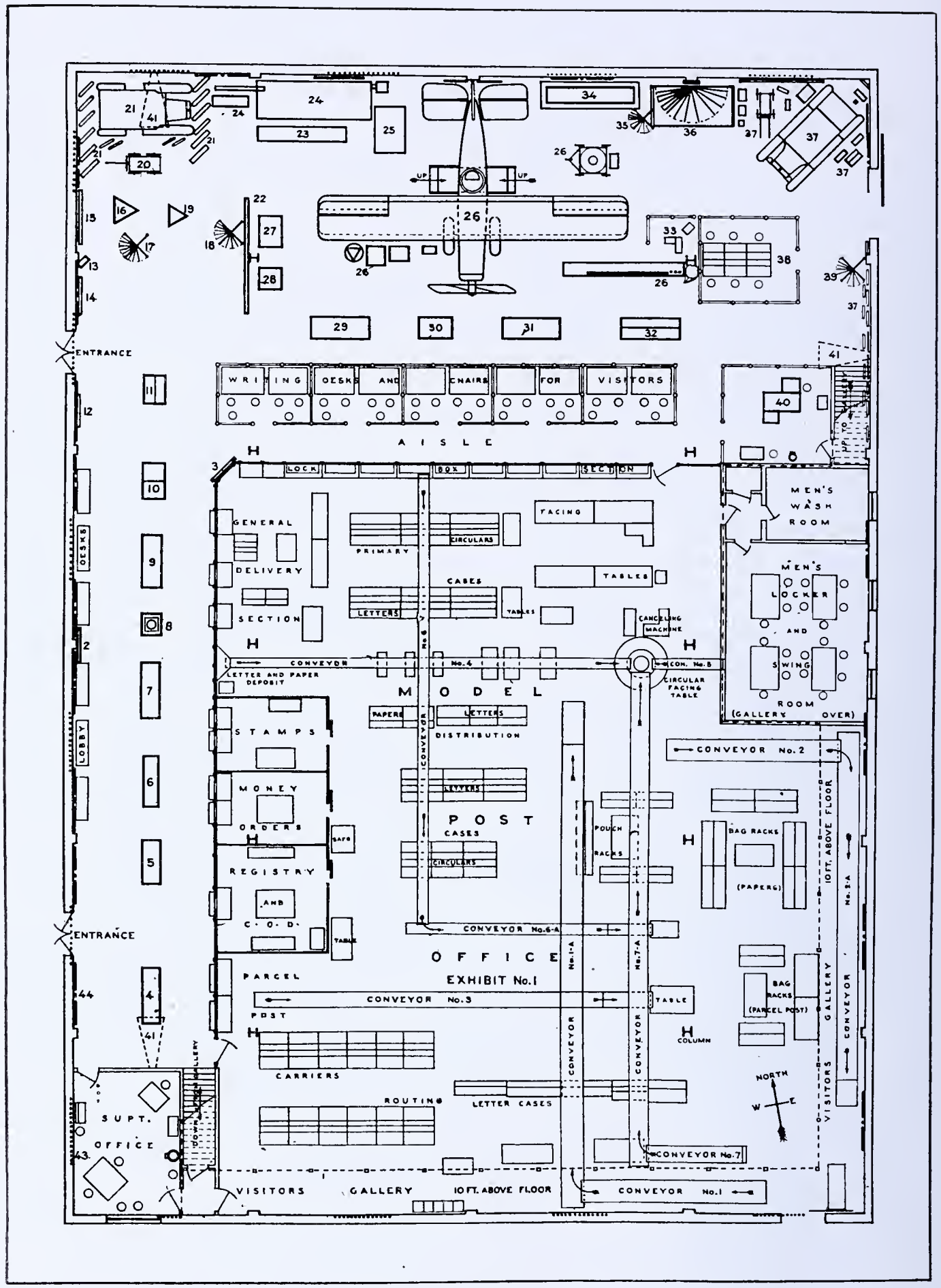

PLATE 55.—Floor plan Model Post Office Building.

Floor Plan Model Post Office Building

1. Model Post Office
2. Portrait of Calvin Coolidge
3. Portrait of Harry S. New, Postmaster General
4. Old annual reports, letters, postal guides, etc.
5. Case containing "Gold Brick," etc.
6. Case containing mail order fake medicinal "cures"
7. Case containing implements used by the "Newton Gang"
8. Bust of Benjamin Franklin
9. Tools used by Gerald Chapman and "Dutch Anderson"
10. Fire arms of Gerald Chapman and "Dutch Anderson"
11. Photographs, guns and tools taken from bandits and yeggs
12. Picture of Joseph Weil
13. Photographs and fire arms used by the "Newton Gang"
14. Picture of "Illinois 40 Thieves"
15. Guns, photographs, etc., used by the "Dinty" Colbeck gang, St. Louis "23" holdups
16. Triangle of three paintings of the "Okesa Train Robbery"
17. Display rack showing photographs of notorious postal offenders, and charts of Post Office Inspection Service activities
18. Display racks—mail frauds, pictures and facts concerning fraudulent schemes
19. Triangle of three paintings of the "Rondout Holdup"
20. Miniature model of horse-drawn mail vehicle known as "Screen Wagon"
21. Motor Vehicle Service
22. Post Office Department organization chart
23. Alaskan dog sledge and equipment for U. S. Mail Service
24. U. S. mail by pneumatic tubes and underground electric monorail car
25. Liberty aviation motor—disassembled
26. U. S. Air Mail Airplane No. 330, and air mail equipment
27. Miniature model plane "De Haviland"
28. Case containing U. S. Postage Stamps, etc.
29. Case containing various articles lost in the mails
30. How and How Not to Wrap Parcels
31. Case containing articles lost in the mails
32. Dead Letter Office display easel
33. Cancelling machine and collection letter box
34. Miniature Model Railway Post Office Car
35. Display rack of various forms used in the Postal Service
36. Post Route map display rack, with rural maps of each state
37. Rural delivery, mail boxes, sacks, pouches, etc.
38. Directory Clerks' Exhibit
39. Display rack giving Post Office organization
40. Stamped envelope manufacturing machine
41. Three automatic delineascope machines
43. 14 oil paintings
44. 19 Open Books

PLATE 56.—View of the front lobby of the Model Post Office Building, showing the front screen line of the Model Post Office.

PLATE 57.—Front lobby of the Model Post Office Building looking north.

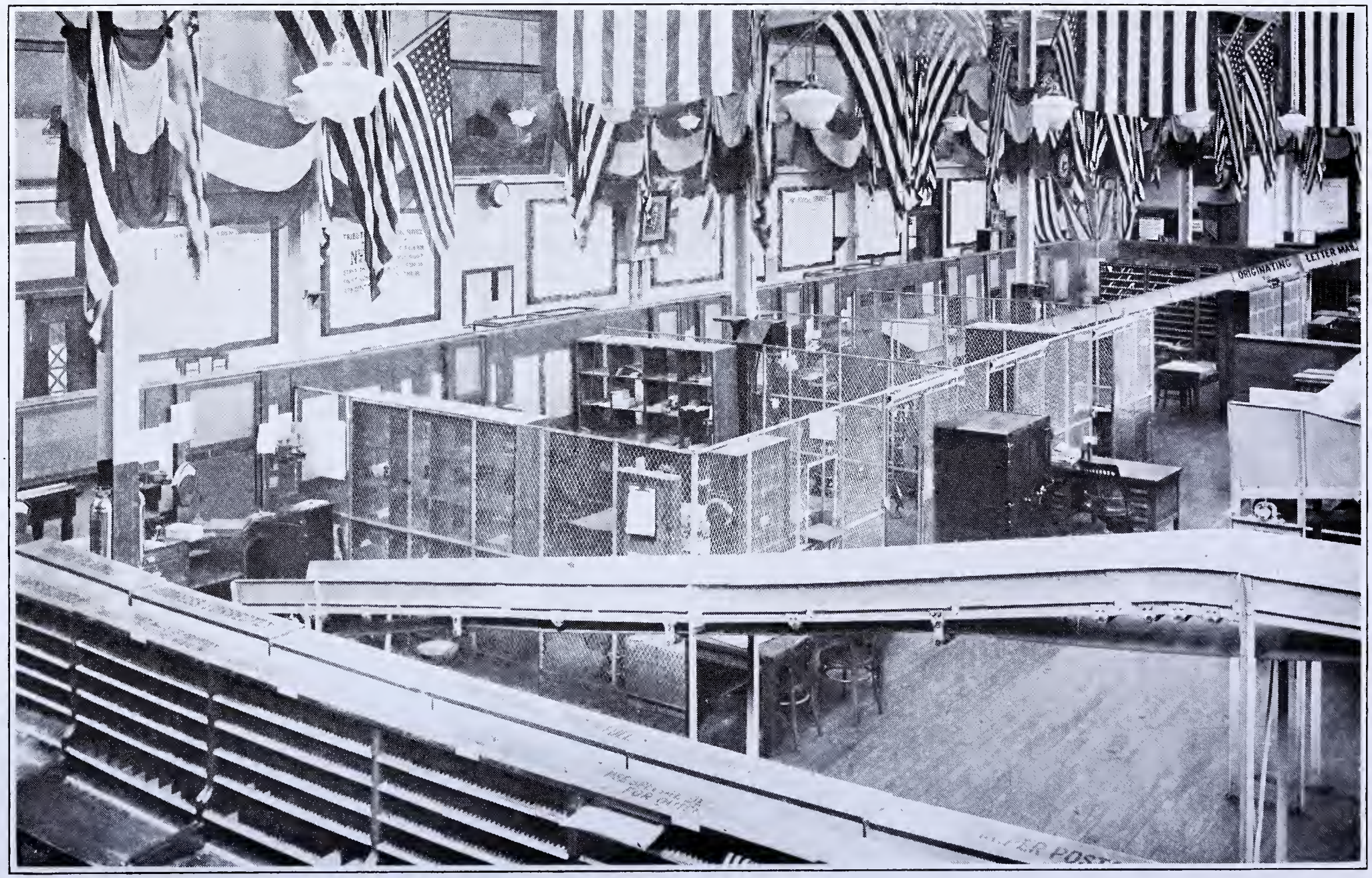

PLATE 58.—View from the visitors' gallery showing some of the cases used by letter carriers, conveyor for parcels, registry cage, stamp cage, money order and postal savings cages, letter drop and conveyor for originating letter mail, space occupied by inquiry section and general delivery, and front lobby of the Model Post Office.

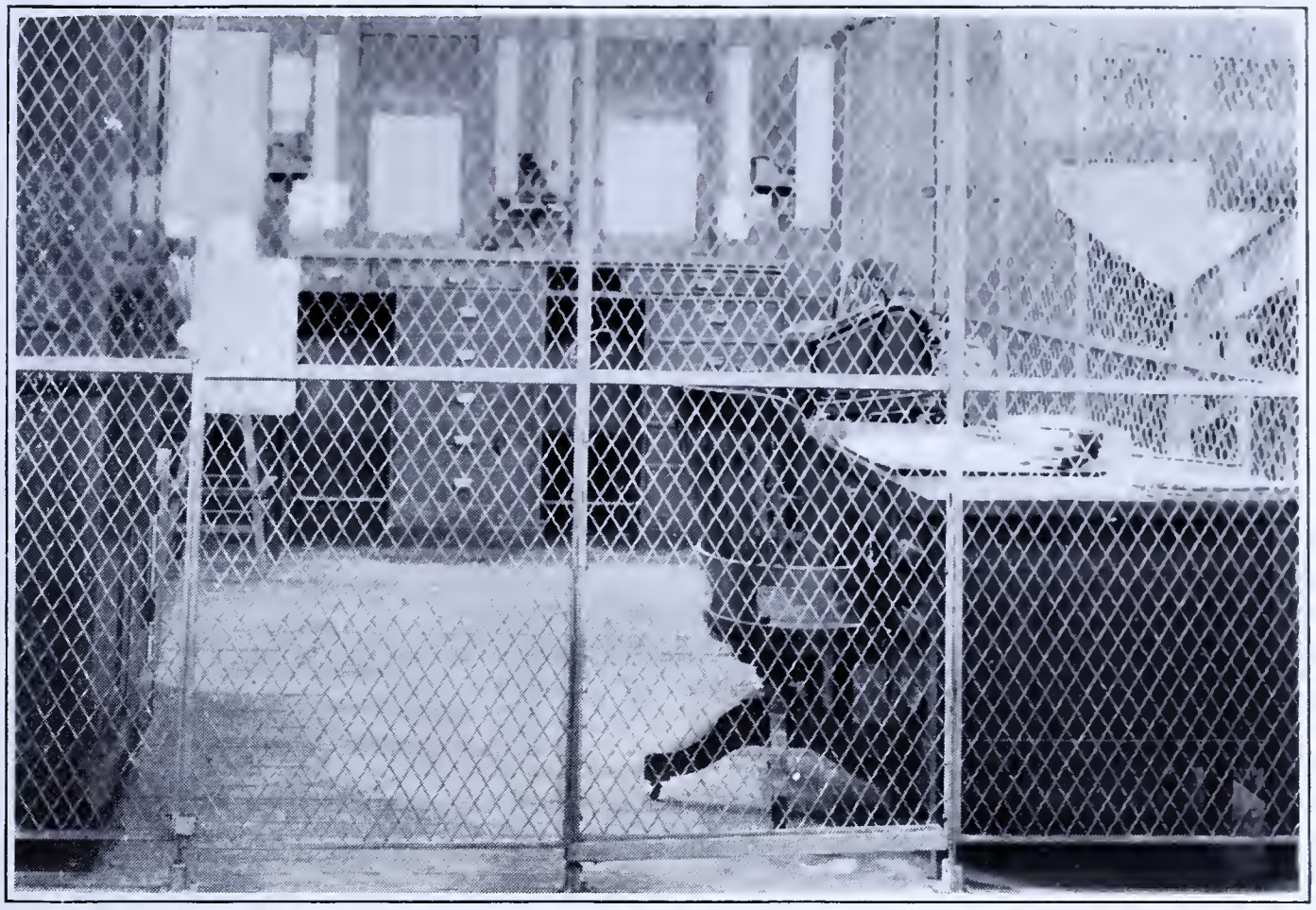

PLATE 59.—Model Post Office—Money Order Section.

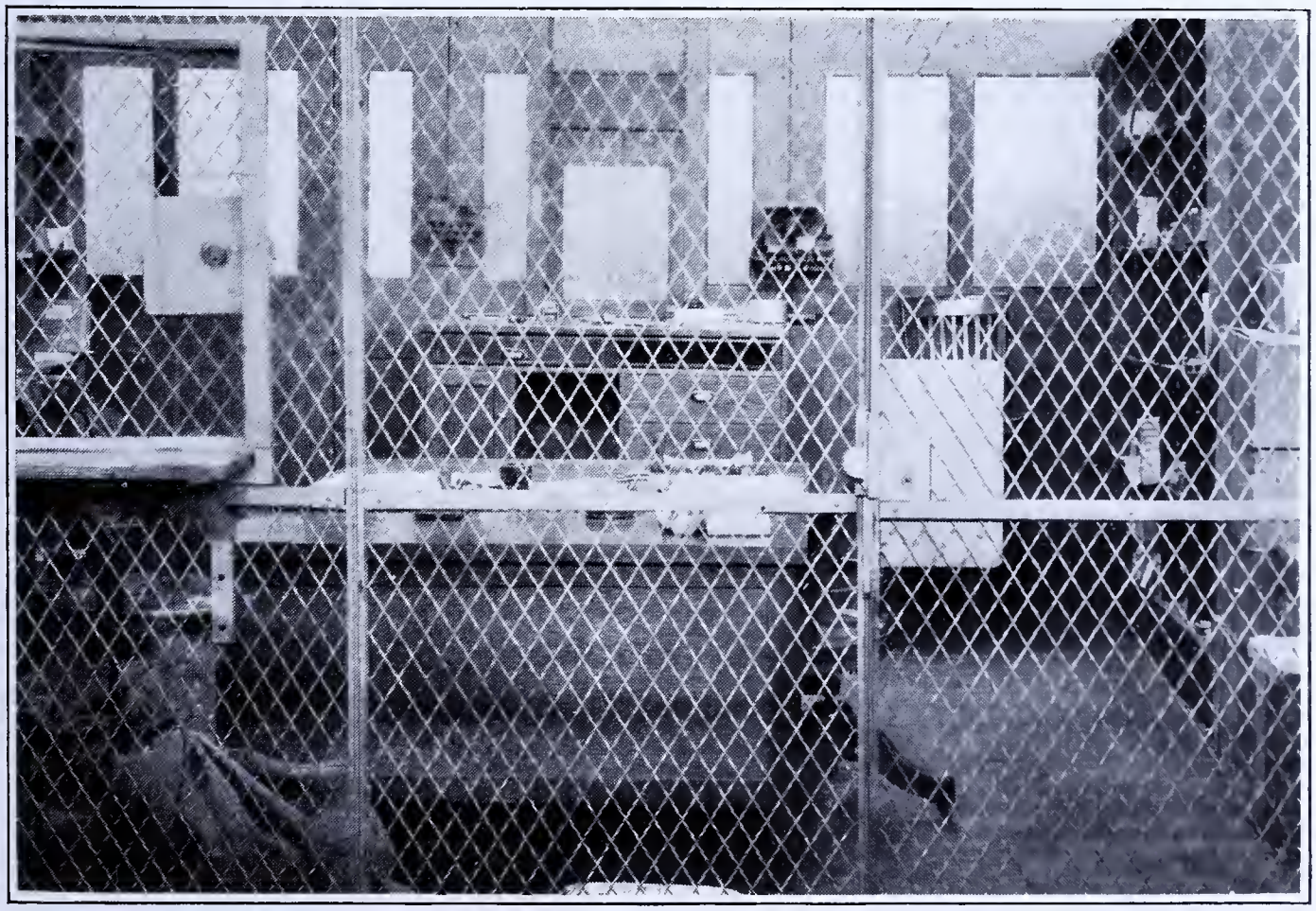

PLATE 60.—Model Post Office—Registry Section.

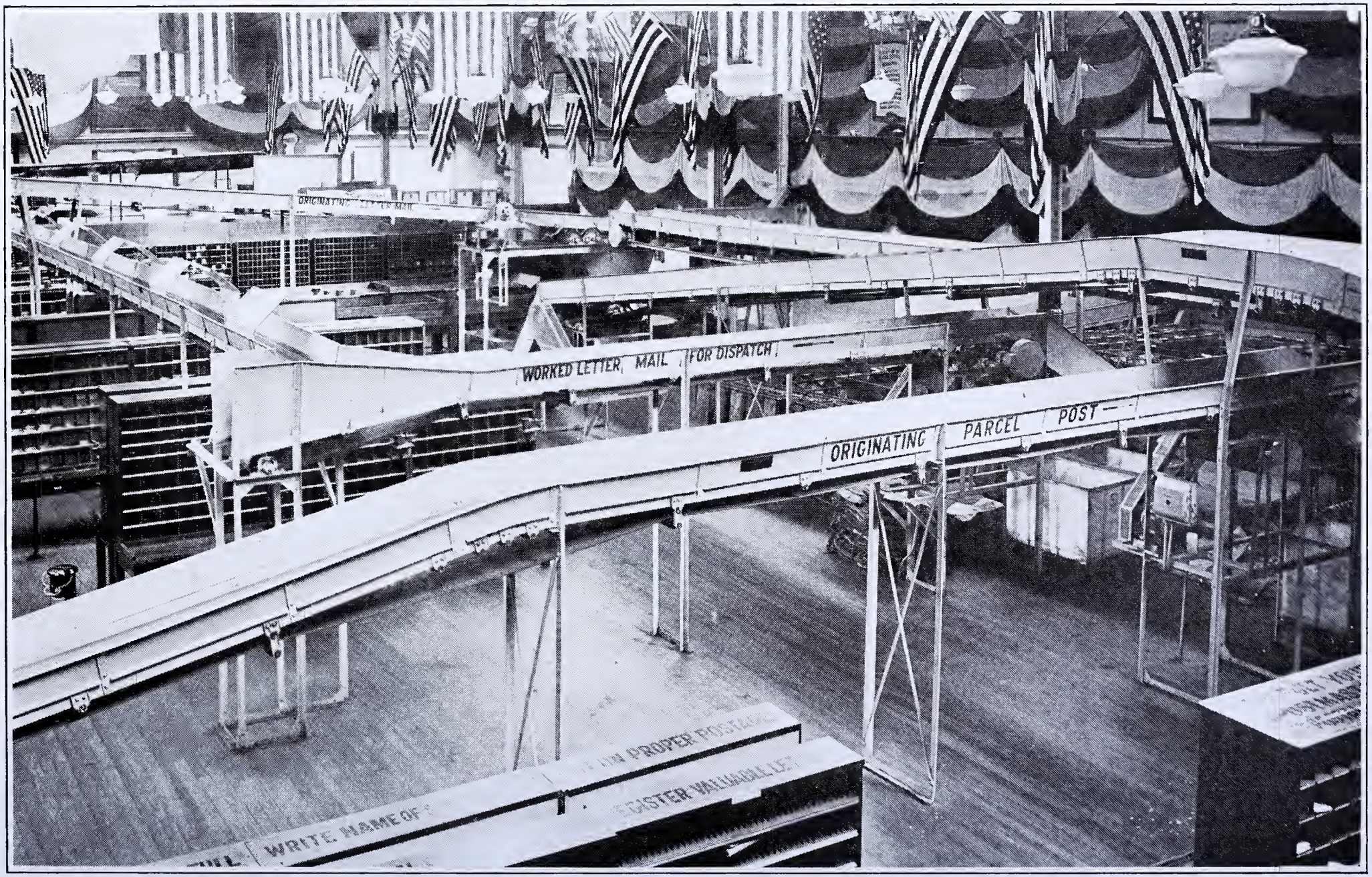

PLATE 61.—View from the visitors' gallery showing conveyors and separating cases.

PLATE 62.—Model Post Office—Center Aisle showing side view of Conveyor for Incoming Mail.

PLATE 63.—Model Post Office—First aisle back of screen line.

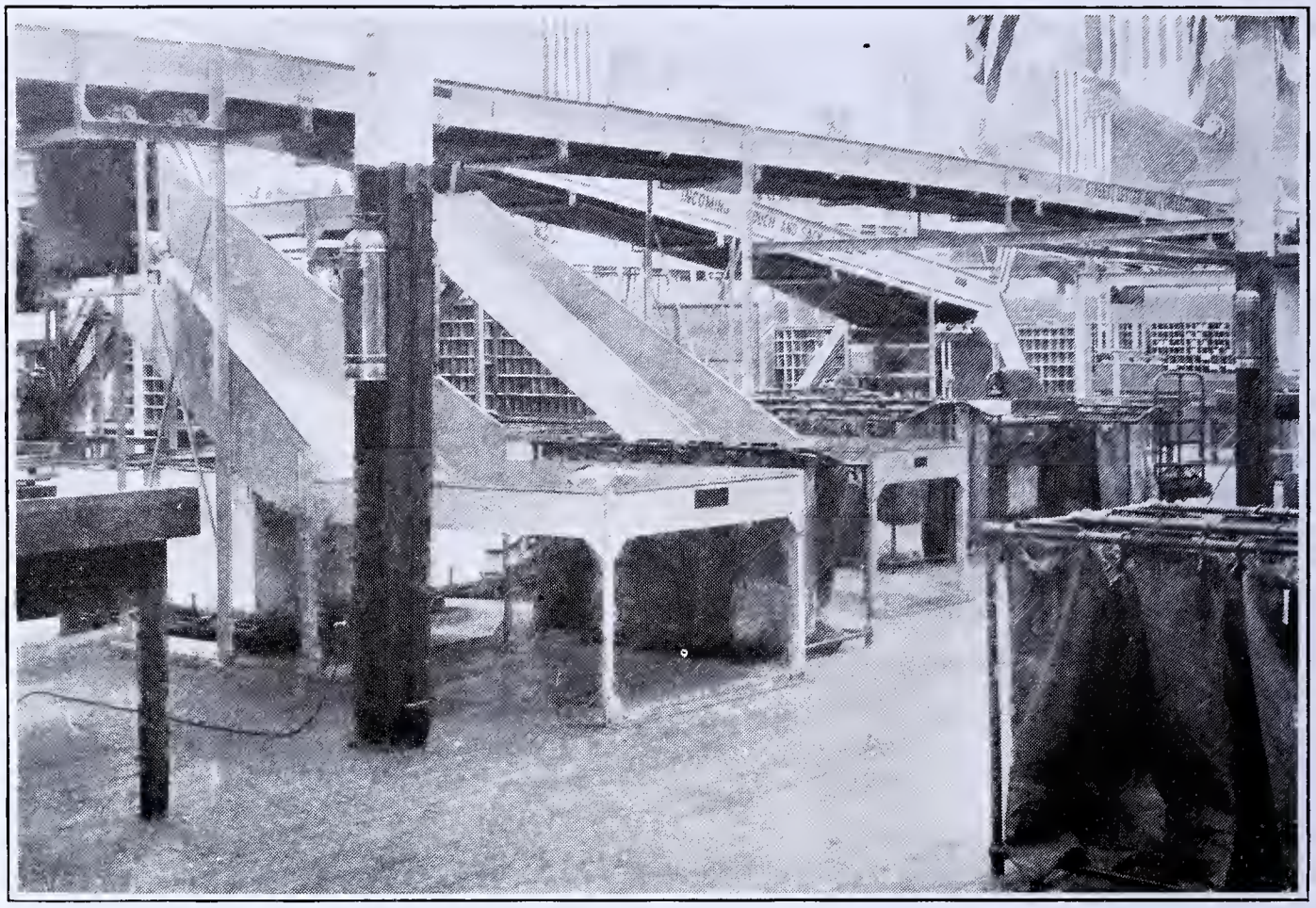

PLATE 64.—Model Post Office—Section showing conveyors, mail racks, etc.

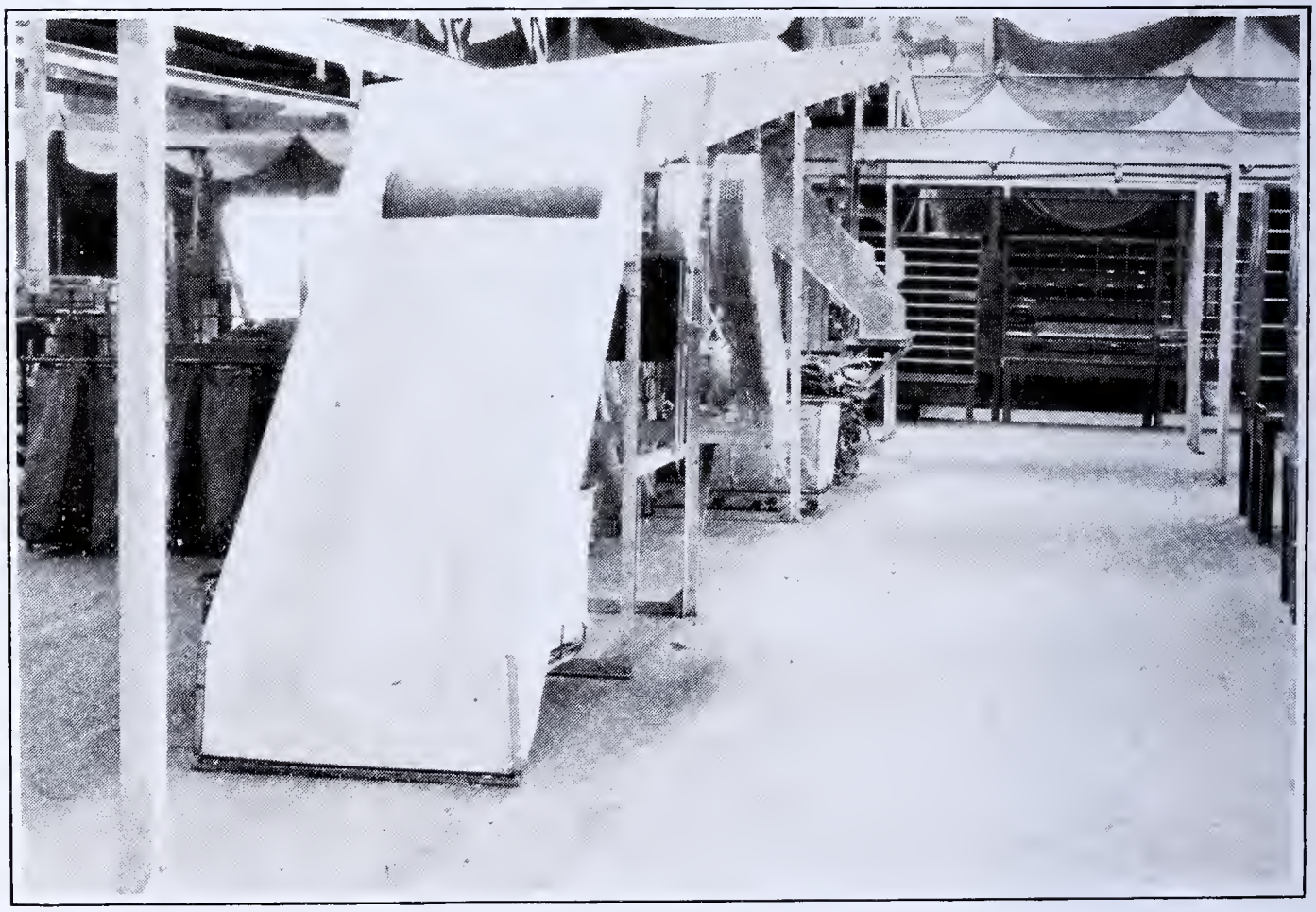

PLATE 65.—Model Post Office—Conveyor for Incoming Mail.

PLATE 66.—Model Post Office—Parcel Post Section.

PLATE 67.—Model Post Office—Parcel Post Conveyor.

PLATE 68.—Model Post Office—Center Aisle—Primary Separation Cases.

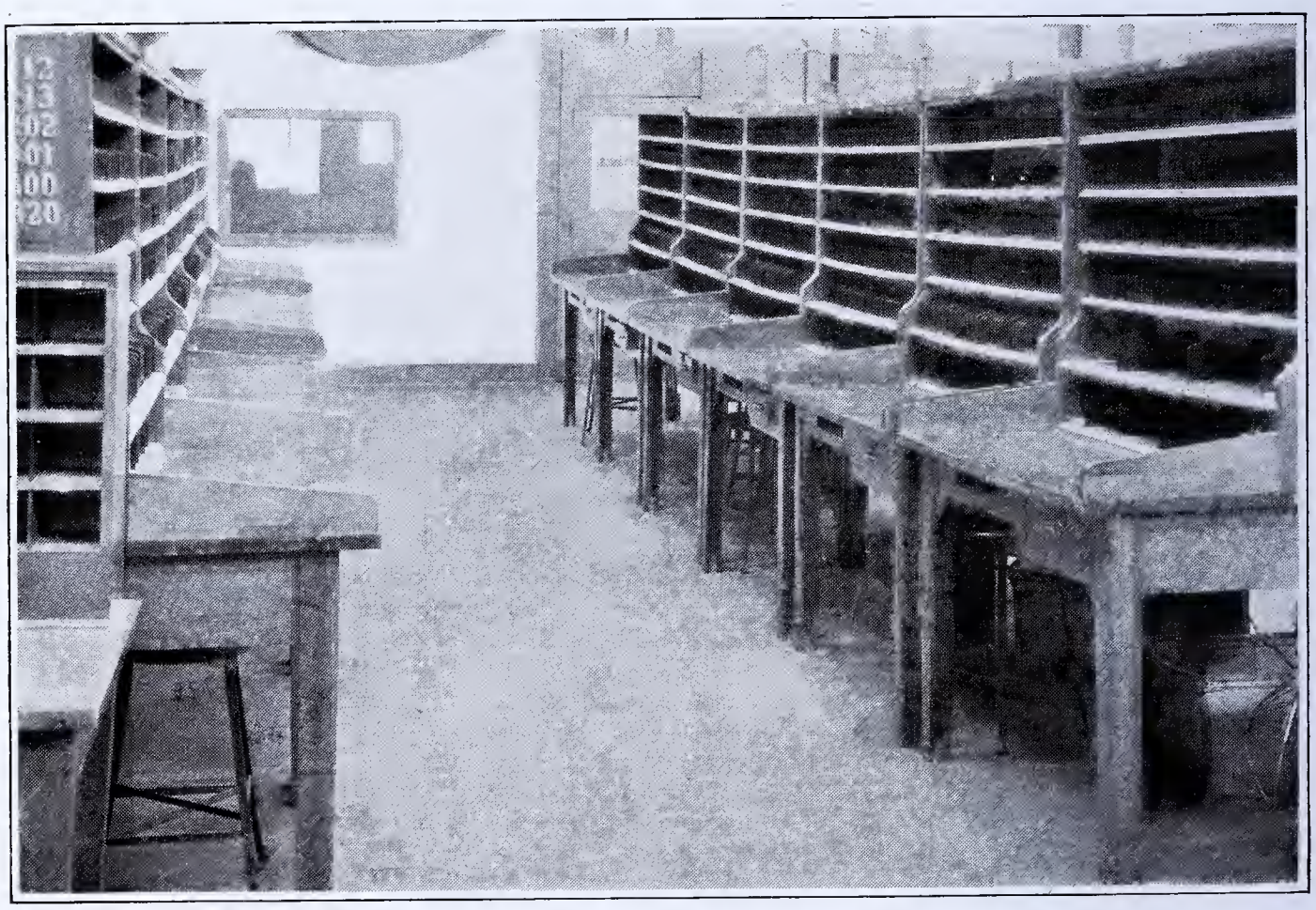

PLATE 69.—Model Post Office—Center view of Letter Carrier Cases.

PLATE 70.—Model Post Office—Section of Letter Carrier Cases.

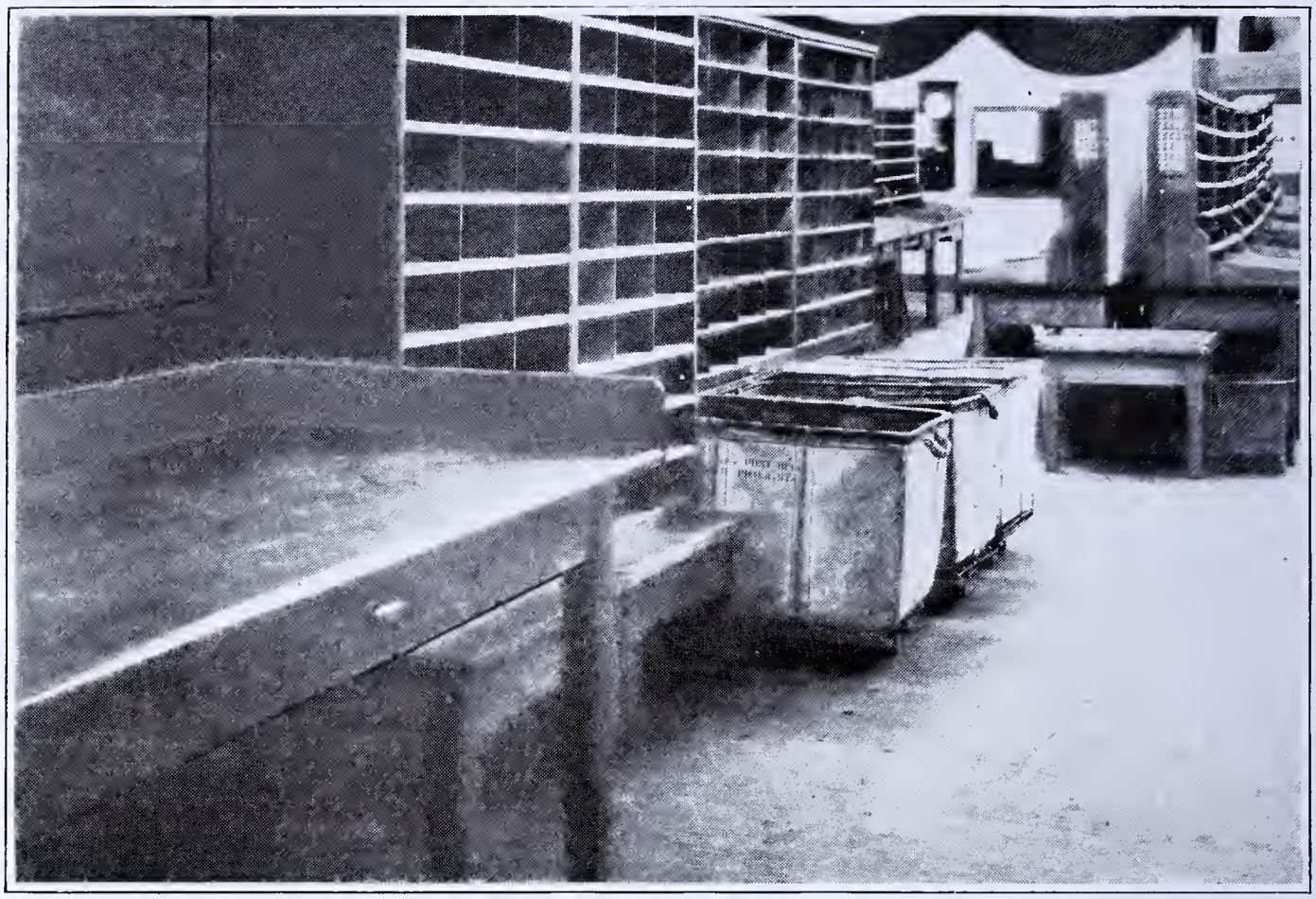

PLATE 71.—Model Post Office—Separating cases for papers, etc.

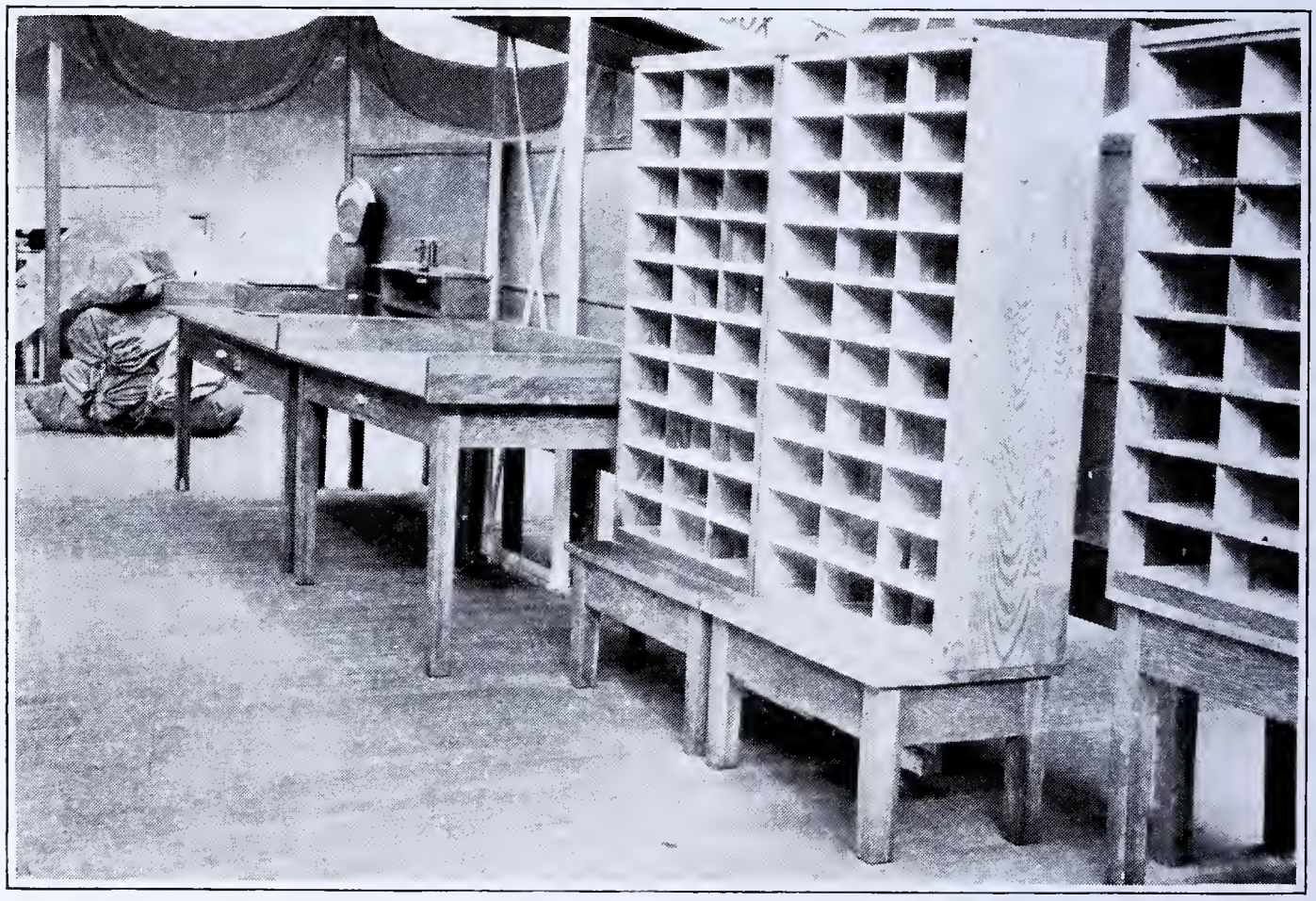

PLATE 72.—Model Post Office—Newspaper and magazine separating cases.

PLATE 73.—Model Post Office—Conveyor for Street Letter Box Collections.

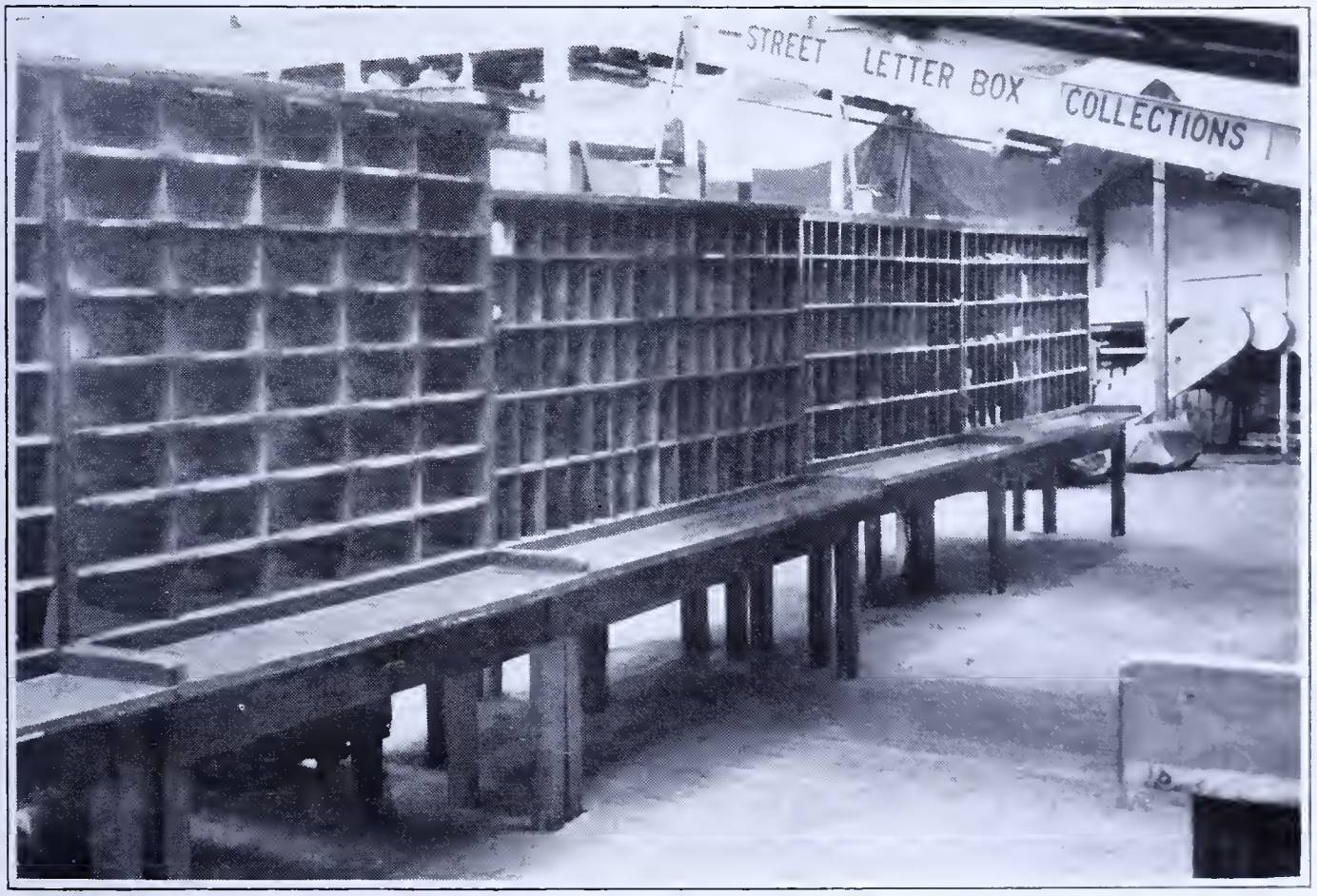

PLATE 74.—Model Post Office—Separating Cases.

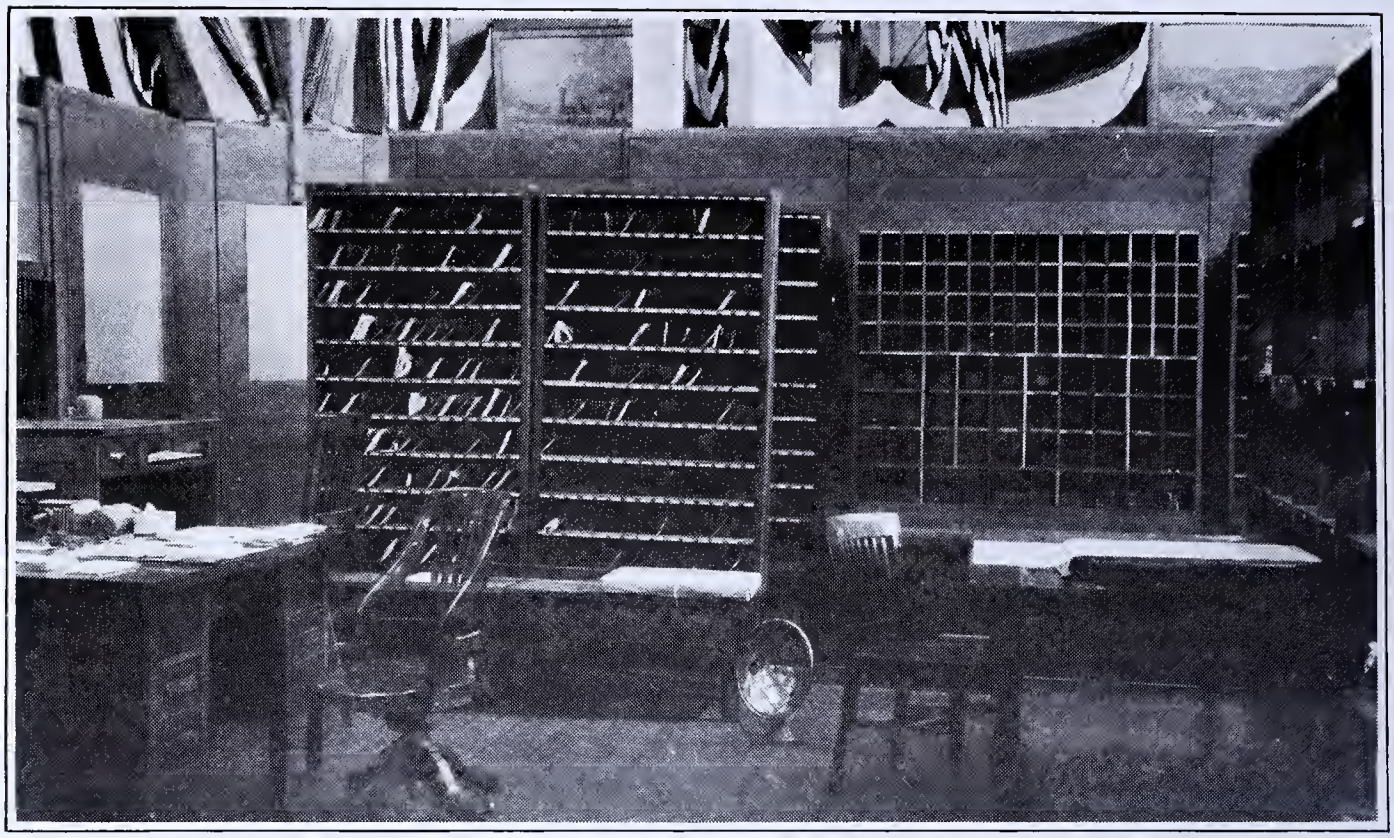

PLATE 75.—Model Post Office—General Delivery and Inquiry Section.

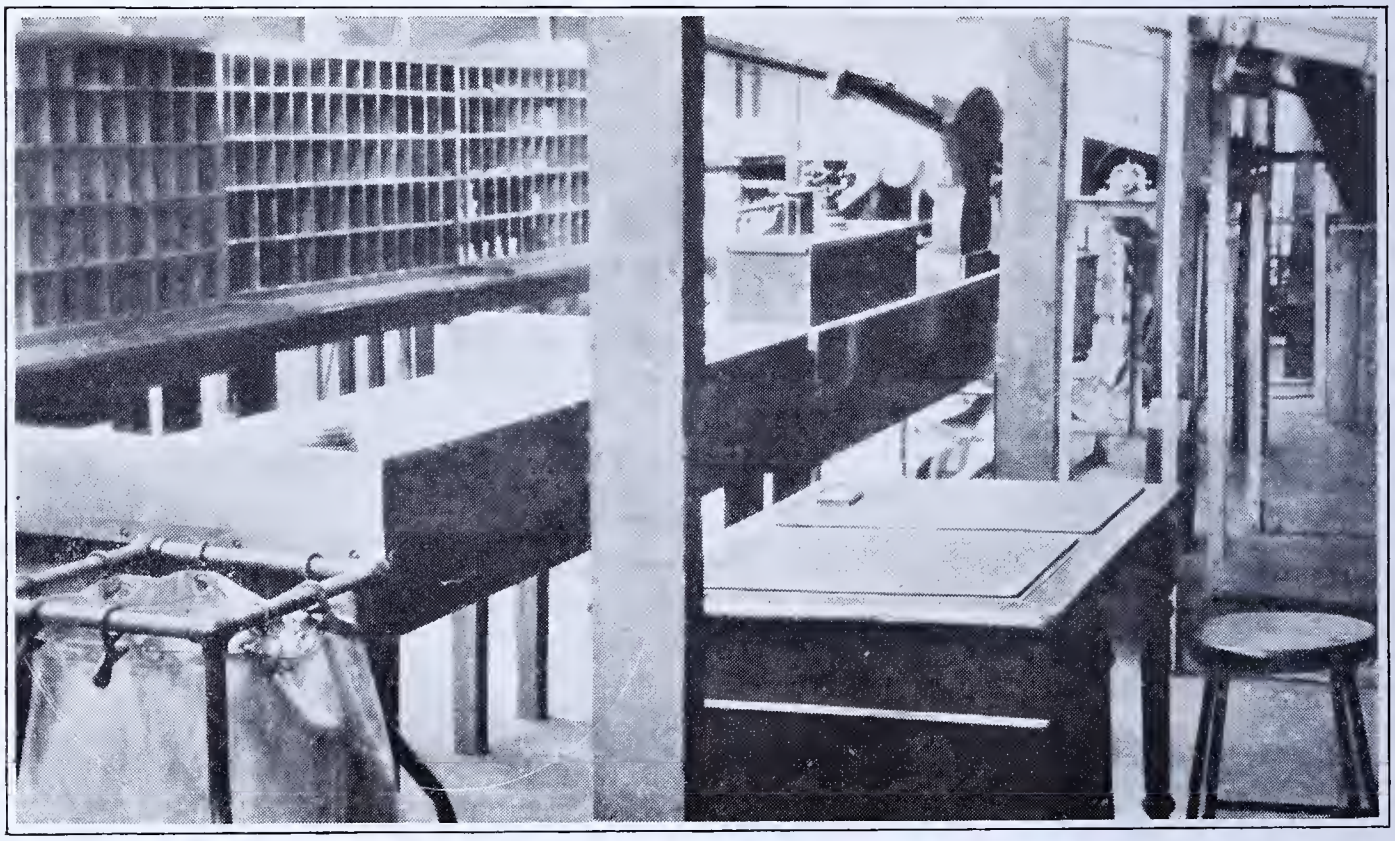

PLATE 76.—Model Post Office—Special Delivery Section.

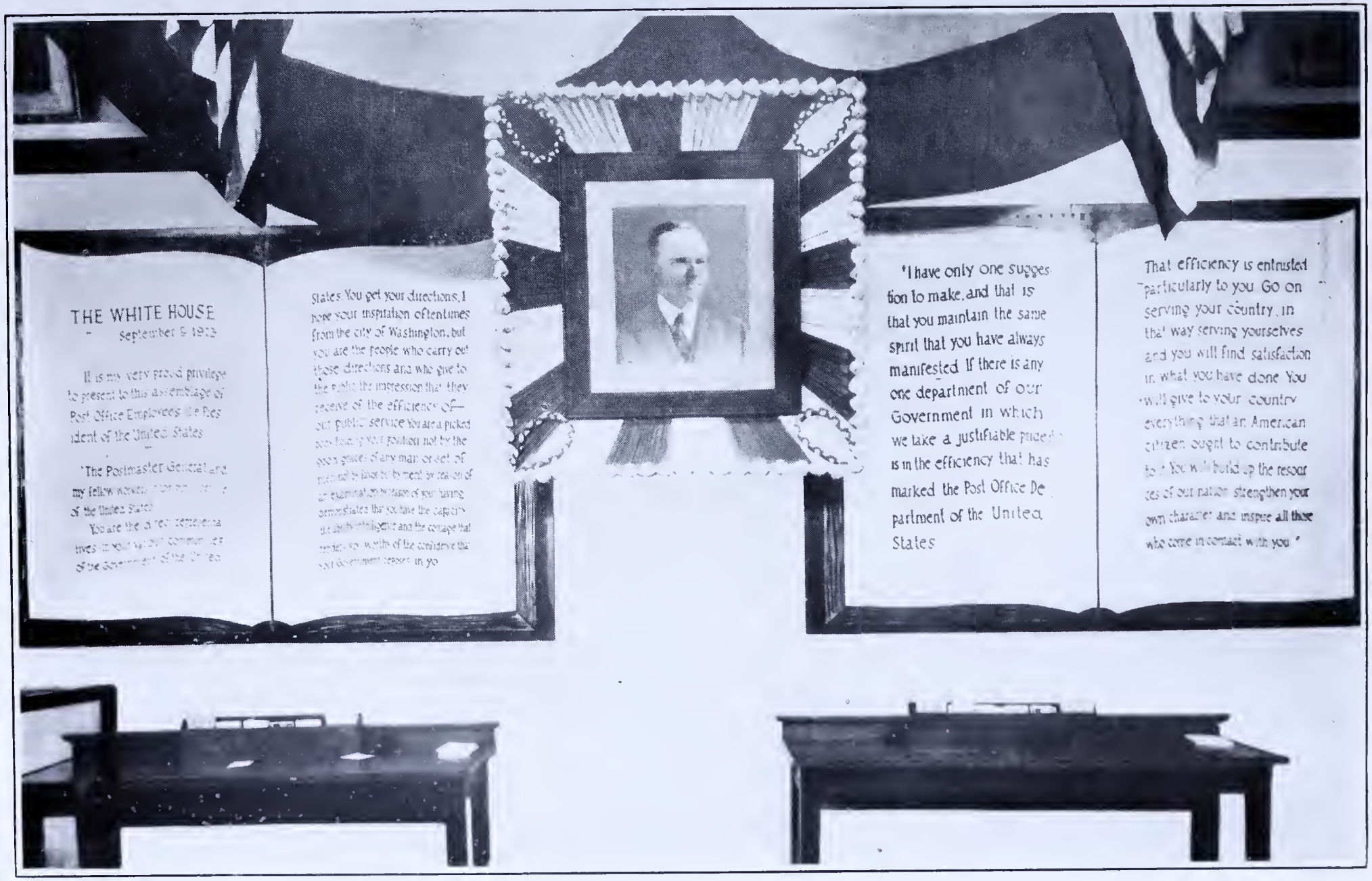

PLATE 77.—Portrait of the President of the United States and two "Open Books" containing a statement by him dated September 5, 1923.

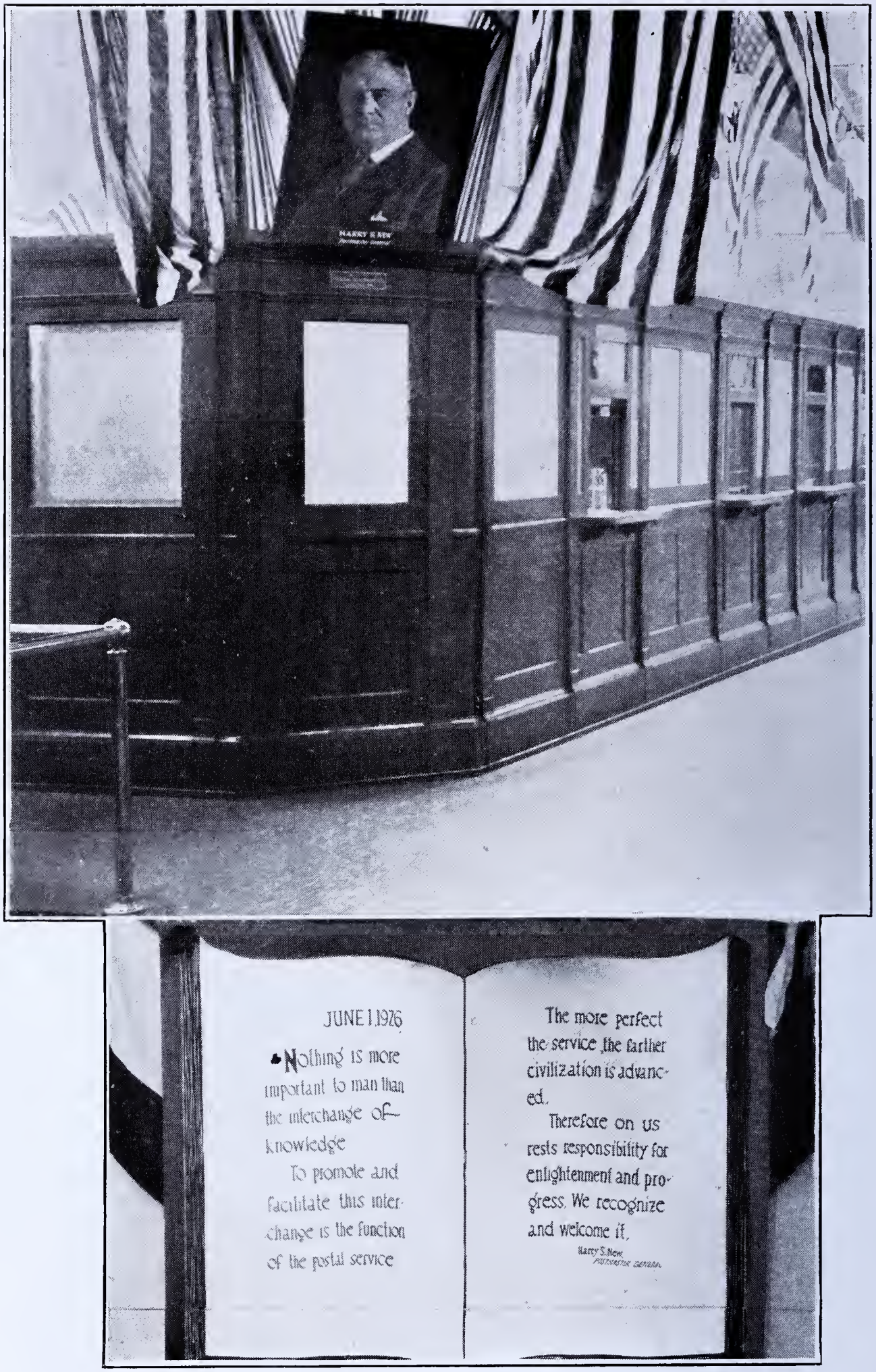

PLATE 78.—Portrait and Statement of Hon. Harry S. New, Postmaster General.

PLATE 79.—Bust of Benjamin Franklin. First Postmaster General.

Model Post Office

A completely equipped model post office was operated as an exhibit and also for the transaction of all post office business, including carrier, collection, special delivery and other services. (Plates 56 to 76).

Portrait of Calvin Coolidge, President of the United States (Plate 77)

Portrait of Harry S. New, Postmaster General (Plate 78)

Bust of Benjamin Franklin, First Postmaster General (Plate 79)

A Case Containing Old Annual Reports, Letters, Postal Guides, Etc.

This exhibit consisted of copies of letters sent by the Postmaster General in 1789 to 1792, from the General Post Office, which at that time was located in New York City. American state papers, Postal Documents, 1789-1833. Book containing plans for improvement of the Postal Service by Postmaster General Osgood, to Alexander Hamilton, Secretary of the Treasury. First Congress—Second Session, three quarterly statements of the post office at Stratford, Connecticut, in account with the General Post Office of America, date July, 1788. Record of contracts for carrying mail by steamboats, 1840-1842. Original ledger of Benjamin Franklin, Postmaster General, 1776, in his own handwriting, showing the accounts with Philadelphia, Pennsylvania, and Cambridge, Massachusetts, post offices. Postal Guides 1805, 1817, 1825, 1831, 1846, 1850, 1874. Journal of Hugh Finley, first Post Office Inspector, 1773-1774. The Post Office Law with instructions, forms and tables of distances; published for the regulation of Post Office—1798. Annual reports: First annual report of the Postmaster General, General Post Office, New York, N. Y., December 9, 1789. Annual report of Postmaster General, March 3, 1834. Annual report of Postmaster General, fiscal year ending June 30, 1891, John Wanamaker, Postmaster General. Annual report of Postmaster General, fiscal year ending June 30, 1925.

A Case Containing Mail Order Fake Medicinal "Cures" Consisting of Such Articles as Soap, Gum, Bottles of So-Called Medicine, Etc.

This exhibit (Plate 80) consisted of a collection of fraudulent medicines against which Fraud Orders have been issued by the Post Office Department. The collection is made up of fake cures for all manner of diseases, prepared in powder, liquid or other form, that have been sold and shipped through the mails in times past. Many millions

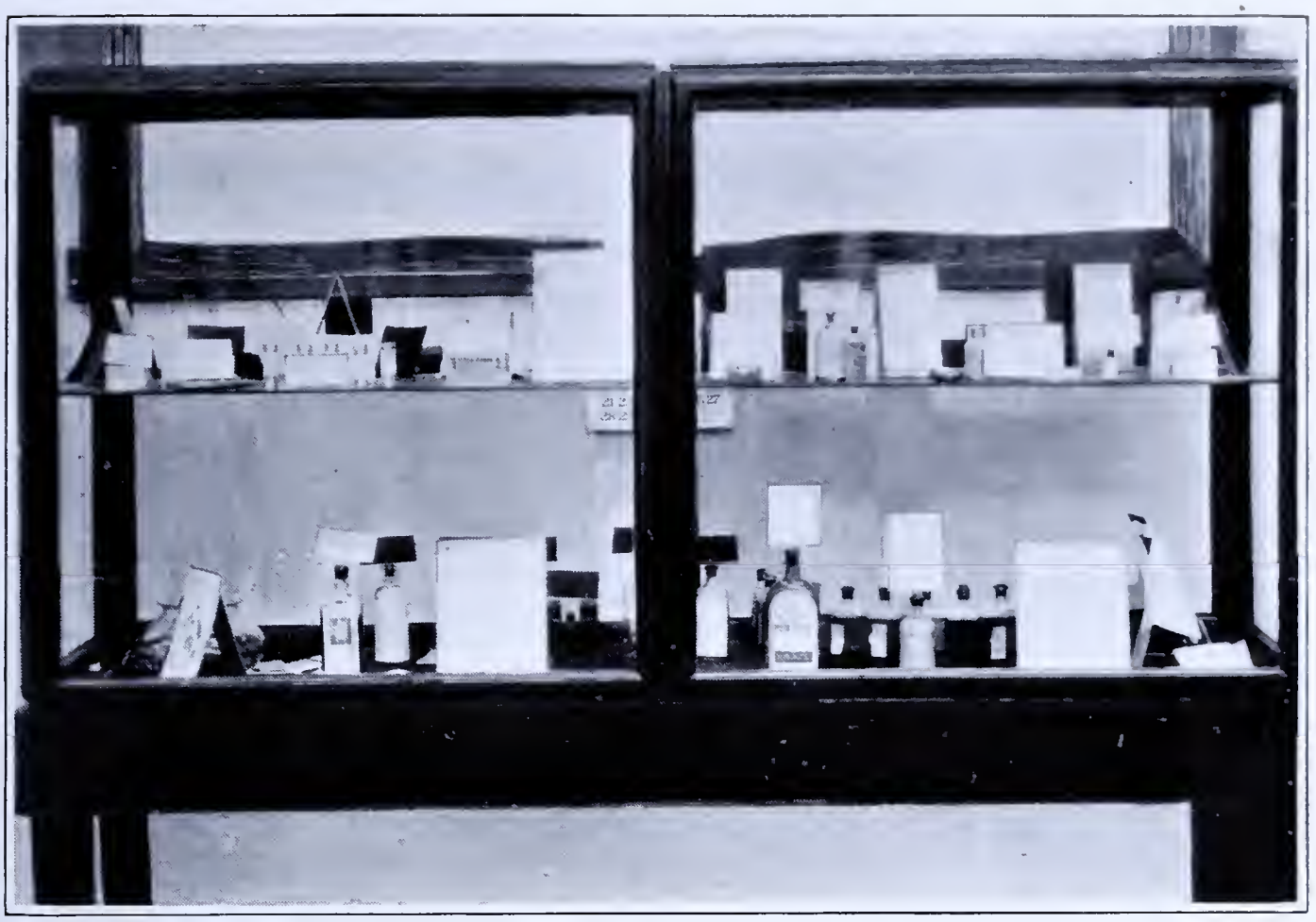

PLATE 80.—Case containing "Mail Order Fake Medicinal Cures."

PLATE 81.—Case containing "Gold Brick," keys, etc.

of dollars have been taken from the public through this means by the unscrupulous. Following is a list of fake medicines noted in the exhibit:

Gas Pipe Therapy
Owen's Electric Belt
Spahr's Big Six Gape 'Em
Parry Medicine Company
Dirigo 1845
Sagine
Silph Gum
Dr. Folt's Soap
Sagrina
Electro-Chemical Rings
Packers Product Company
Willard Pyorrhea Treatment
Korex Compound Tablets
Sam Kate Oxygen Treatment for Catarrh
Sargol
Tuberculene
Purifico
Blessed Handkerchief
St. James Oil
Vital-O Gland Company
Haelan or Heilol
Sex Testers
Professor Henry Samuel's "Eye Water"
Virex Rattlesnake Oil
Amosol
Skeen Stricture Cure
Gall-Tone
"Lewis' Laboratories"
La-Mar Reducing Soap
Dentol

A Case Containing "Gold Brick," Photographs, Skeleton Keys, Revolvers, Tools, Etc., of Mail Swindlers and Robbers.

This exhibit (Plate 81) consisted of a *"Gold Brick"* and photographs of *E. A. Starkloff* and *George W. Post.* These men were arrested by Post Office Inspectors at the Broad Street Station, the *"Gold Brick"* secured, and the scheme exposed. These arrests, not only checked the career of two very daring criminals, but marked the end of the *"Gold Brick"* swindle in Philadelphia and the East. Photographs of *John Alva Turner*, sneak thief and post office robber. Collection of tools, revolver, dagger and skeleton keys taken from Turner after he had dynamited the post office safe at Bradley, Oklahoma, on the morning of February 12, 1926. Some of the keys were made from old spoons and pieces of metal. Photographs of *Jack Kennedy*, alias "the Quail Hunter," and *Lawrence Logsdon.* These two mail train robbers were the worst type of criminals. Such types live and die by violence. They were each killed resisting arrest after holding up the Frisco Mail Train at Wittenberg, Missouri, November 3, 1922. Kennedy's and Logsdon's guns are also included in this exhibit, the longest one being used by Kennedy in nineteen train robberies. Photographs of *Harry Greninger*, alias "Sheeny Harry," and *Eddie O'Brien*, alias "Frisco Eddie." Greninger was the leader of a gang of mail truck robbers that operated

on the Pacific Coast and in the South. He owned the complete burglar's outfit shown in this exhibit and was killed in the use of nitroglycerine. O'Brien was Greninger's accomplice. Both of these outlaws were arrested, Greninger in Birmingham, Alabama, at which place he was convicted and sentenced. O'Brien participated in a mail truck robbery at Toledo, Ohio, where loot aggregating one million dollars was secured. He was sentenced to serve a term of fifty years in the Federal Penitentiary at Atlanta, Georgia.

A Case Containing Implements Used by the "Newton Gang" in One of the Largest Train Robberies Known in the History of the Post Office Department

About 10 p. m. on the night of June 12, 1924, a number of bandits known as the "Newton Gang" held up and robbed Chicago, Milwaukee & Saint Paul Train No. 57, near Roadout, Illinois, about 20 miles north of Chicago. Train No. 57 is a Fast Mail between Chicago and Minneapolis, and on this date carried 11 cars.

This exhibit showed implements which were used by the "Newton Gang" in this robbery, as follows: *Acetylene Torch Outfit*, consisting of tank, gauges, rubber hose, acetylene torch, electric torch lighter, protected eye goggles, nipples, gas-mask, bottle containing *Formaldehyde*, and the "Million Dollar Spade." This spade was used by Post Office Inspectors to unearth the buried treasure, which was discovered in a thicket, located about 25 miles from Kansas City, Mo. One million dollars was recovered. The treasure was buried in six jars shown in this exhibit and consisted of diamonds and jewelry valued at about $50,000.

The bandit gang consisted of Willis, Wylie, Jesse and Joseph Newton, Brentwood Glasscock and Herbert S. Holliday, and James Murray, and William J. Fahy, who acted as outside men, advisers and accomplices.

The six bandits who actually executed the robbery and Murray and Fahy, their accomplices, were all apprehended, and practically all of the loot has been recovered.

A Case Containing Photographs and Fire Arms Used by the "Newton Gang"

This exhibit (Plate 82) consisted of 5 revolvers of various patterns, 1 holster, 1 automatic rifle presented to the Chief Inspector, 1 automatic rifle presented to the Postmaster General, 8 photographs of the Newton Gang, consisting of Jesse, Willis, Wylie, and Joseph Newton, Herbert S. Holliday, James Murray, William J. Fahy and Brentwood Glasscock.

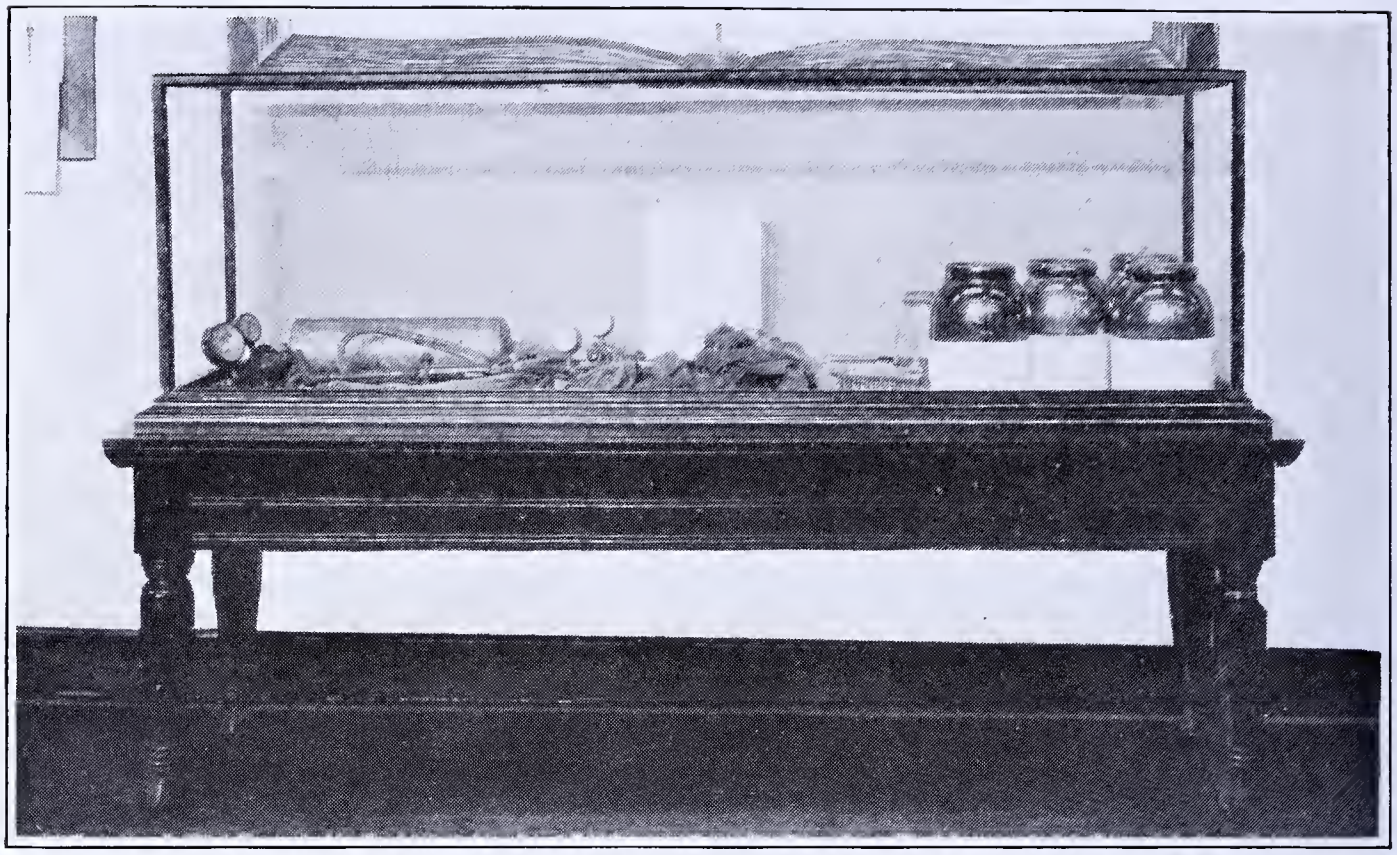

PLATE 82.—Case containing fire arms used by "Newton Gang."

PLATE 83.—Case containing photographs and guns used by "Chapman and Anderson."

A Case Containing Tools Used by Gerald Chapman and "Dutch" Anderson in Making Their Escape From the Federal Penitentiary at Atlanta, Georgia.

A Case Containing Fire Arms and Photographs of Gerald Chapman and "Dutch" Anderson, and Photograph of Detective Hammond. (Plate 83).

A Case Containing Articles Used in a Bomb Sent by Mail, Photographs, Guns and Tools Taken From Bandits and Yeggs.

This exhibit (Plate 84) showed *portion of bomb* recovered after explosion, and various articles found on defendant's workbench. Expert testimony proved that these pieces are identical with materials from which bomb was made. Parcel containing bomb was delivered at home of addressee on December 27, 1922, and was carried to living room. Parcel was opened by addressee in the presence of his wife and grandson. Immediately upon the removal of the wrapper the bomb exploded and resulted in the maiming of the addressee and the death of his wife. A metallographer testified that portions of metal found in the bomb are not only similar to pieces on defendant's workbench, but actually came from the same pieces. Forestry expert testified that shavings found on the defendant's workbench were the same kind of wood as the wooden portions of the bomb. Explosive expert testified that, from manner of explosion and color and action of smoke, the explosive used was TNT. A box of this explosive was found on defendant's farm. Chemist found that ink used in addressing wrapper of bomb was a combination of writing fluid and Carter's Black Ink. Fountain pen partially filled with a combination of these two inks was found in defendant's house. Three handwriting experts testified from enlarged photographs of addresses on the wrapper and of specimens of defendant's handwriting, that the wrapper was addressed by the defendant. Handwriting specimens shown as separate exhibit. Defendant was convicted of murder and tried and given life sentence in State Penitentiary.

Tools taken from Bandits and Yeggs: *Revolvers* and *automatics*, *Maxim silencer*, *"Sawed-off shotgun, Chicago style,"* these recovered from John Barry, convicted in Dearborn Street, Chicago, mail truck robbery; *hacksaws*, the yeggman's *"Come-along,"* a device used in drilling holes in safe doors, bandit's *blackjack*, *cop detector* (opera glasses), *skeleton keys*, genuine *shillalah*, or *"Irish Rifle."* This shillalah was used in the Irish Riots in 1797, and by a gang of Chicago bandits until very recently, when it was recovered in a raid; *signal bell*, used by the outside man or "lookout." A *"Peetman's Soap Cup." "The Peetman's Soap Bottle,"* (nitro-glycerine), and *Fuses;* a *Padded Hammer* and

Jimmies. Photographs of *"Al" Spencer* and his six confederates. The photograph of Spencer was taken after he had been killed by post office inspectors, when resisting arrest. "Al" Spencer was a much-hunted outlaw, and generally called "The Phanton of the Osage Hills." This man robbed more banks and killed more people than any other outlaw of the Southwest. His criminal career began with the theft of cattle and hogs for which he was convicted and sentenced to the penitentiary at McAlester, Oklahoma, for five to ten years. He was pardoned, and returned to his home, a ranch in the Osage Hills. Then, he began a series of bank robberies and holdups which were unparalled in the history of the state, successfully evading the officers for five years. He was leader of the gang that committed the Okesa holdup. On September 15, 1923, 25 days after the robbery, Spencer was surrounded in a desolate spot in the Osage Hills. He was ordered to surrender. True to his previous boast that he would not be taken alive he chose to fight it out and was killed in the battle that followed. *Frank Nash,* notorious bank robber and Murderer. *Earl Thayer,* notorious Oklahoma outlaw, involved in at least 3 train robberies and innumerable bank robberies. *Riley Dixon* was a brother-in-law of "Al" Spencer, was part Indian, and at one time had considerable property from his Indian inheritance. He dissipated his fortune, and finally joined Spencer in a career of crime. He participated in the Okesa holdup and was convicted and sentenced. *Grover C. Durrill,* right hand man of Spencer, cowboy and rancher of Osage County, Oklahoma. Took a leading part in the Okesa holdup. After Spencer was killed, Durrill barricaded himself in a little cabin in the Osage hills. This cabin was surrounded and after several shots had been fired into it, Durrill came out with his hands in the air. On his person was found $4,000 in Liberty Bonds stolen in the robbery. He was convicted and is now serving a 25 year sentence in the Federal Penitentiary at Leavenworth, Kansas. *Curtis Kelley,* cowboy and rancher in Osage County, Oklahoma. He was fascinated by newspaper accounts of the daring deeds of "Al" Spencer, who was a hero in the eyes of Kelley. Kelley participated in the Oklahoma holdup at Okesa and was convicted and sentenced to serve 20 years in the Federal Penitentiary at Leavenworth, Kansas, where he is now confined. *George Curtis:* this man came from a good family in Illinois. Participated in the Okesa holdup and following the robbery, he fled to his old home in Illinois where he was arrested. He was convicted and sentenced to serve 25 years in the Federal Penitentiary at Leavenworth, Kansas. Each one of Spencer's six confederates are now serving a 25 year sentence in the Federal Penitentiary at Leavenworth, Kansas.

PLATE 84.—Case containing photographs and guns taken from mail bandits.

PLATE 85.—Picture of "Illinois 40 Thieves."

A Picture of Joseph Weil, Commonly Known as "Yellow Kid" and "Kid Weil"

The following information was given on a printed card attached to picture:

Concerning his activities, "Yellow Kid Weil," when not sojourning at penal institutions, had his local habitation in the congenial atmosphere of Chicago, where he figured prominently in night-life resorts, the Courts of Criminal Investigation and newspaper headlines. He is pictured here in two of his typical impersonations when pursuing his chosen vocation of confidence-game worker—as "Dr. Warrington," with the luxuriant whiskers; pseudo-millionaire; dignified and distinguished foreign capitalist seeking large investments in the United States; and as "Dr. Weil," with the neat mustache; wealthy but affable and companionable bon-vivant as befitting one of sporting tendencies and with extensive interests in the business of raising thorobred cattle and race horses, incidentally visiting this country for the purpose of expending a million dollars or so in the purchase of fancy stock for his large breeding farms in France and Germany. With the courtly and suave "Doctor" is shown here keen-eyed and capable "Jimmy Head," his "Confidential Secretary," usually introduced to the selected dupe as "J. Eddinger von Courtland," or some such high-sounding name consonant with his position of trust and responsibility as companion to so eminent and distinguished an employer. A small picture in this exhibit gave a simple presentment of the aforesaid Joseph Weil, shorn of the camouflage of fictitious personality and appearing here as disillusioned "Convict 25,654, sentenced to a term of penal servitude and expiation in the Federal Penitentiary at Leavenworth, Kansas, through the persistent energy of Inspectors of the Post Office Department.

Picture of "Illinois 40 Thieves."

This exhibit (Plate 85) consisted of a framed gallery of the so-called "Illinois Forty Thieves," showing pictures of bandits grouped around a description of them, and contained photographs of the Newton Brothers, former Inspector William J. Fahy, and the gang operating at Staunton, Pocahontas, Carlisle, Marion and Salem, Illinois. All of the men whose pictures appeared in this cabinet are thieves, bandits and gun-men.

Within the past two years they have all been convicted in Federal Courts for mail hold-ups with guns in the State of Illinois. This is the maximum offense that can be committed against the mails. They have been sentenced to serve 1,079 years in the Federal Prisons at Leavenworth and Atlanta.

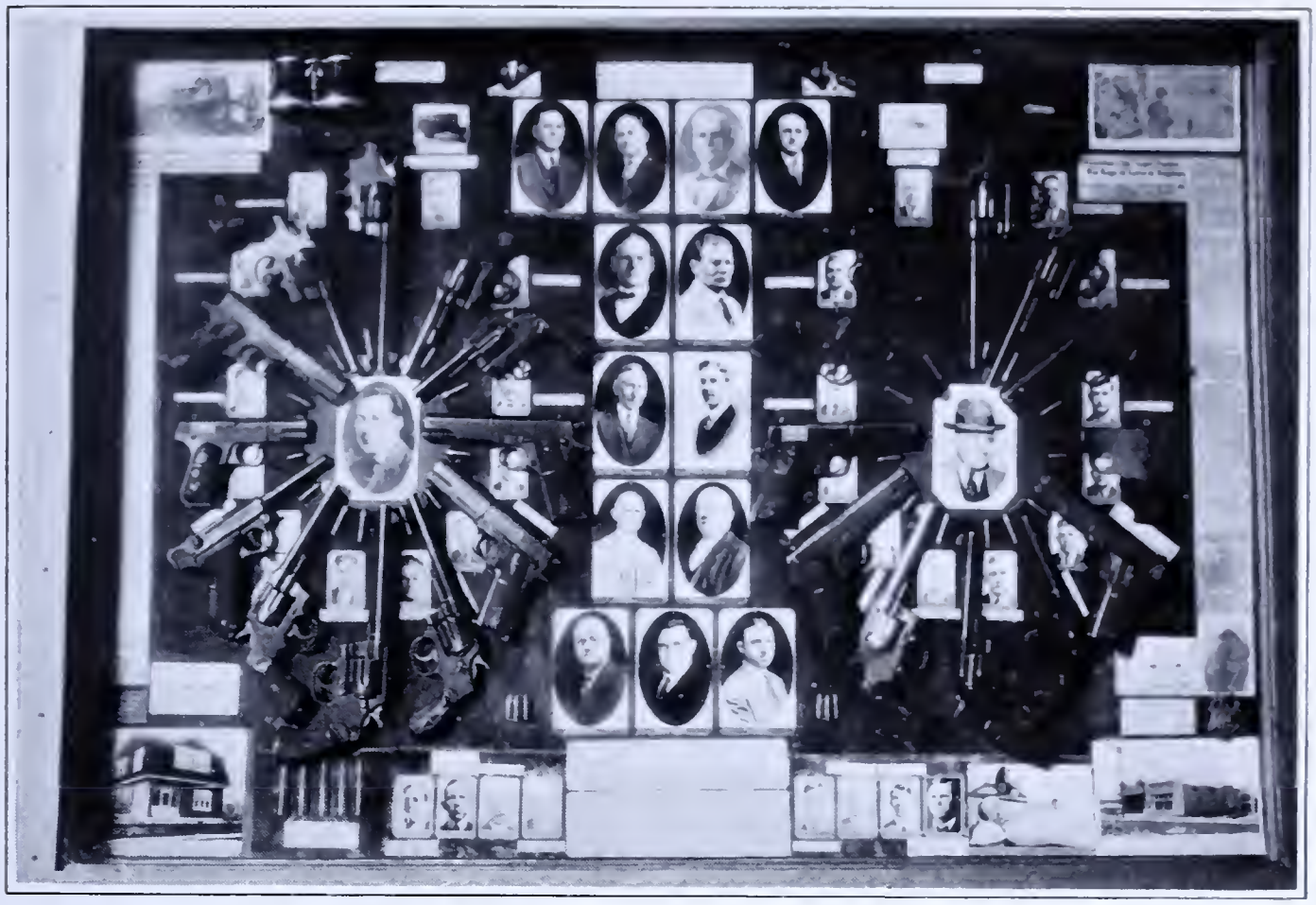

PLATE 86.—Case containing photographs and guns used by the "Dinty" Colbeck gang.

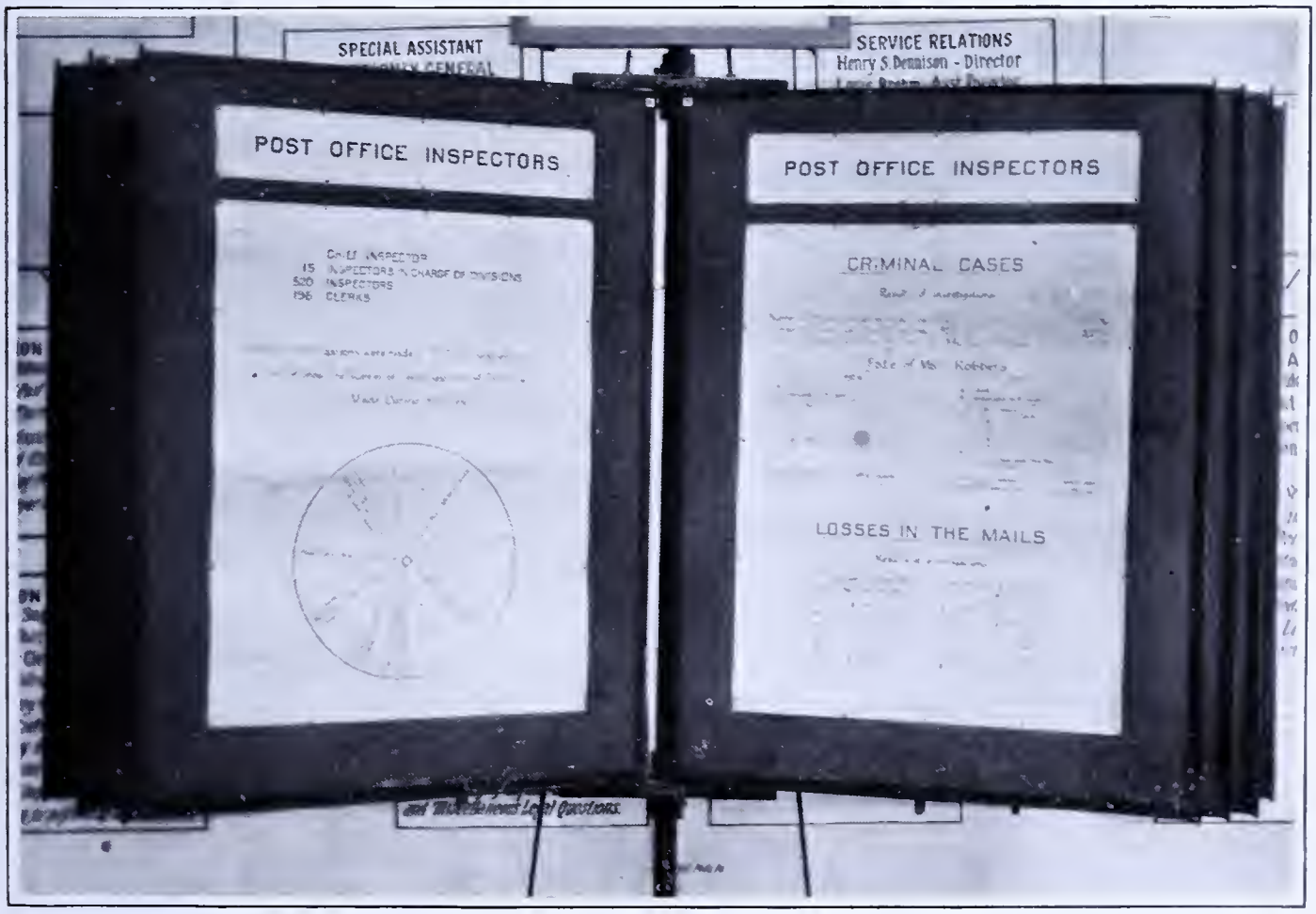

PLATE 87.—Display rack showing the work and statistics of the Postal Inspection Service.

A Case Containing Guns, Photographs, Etc., Used by the "Dinty" Colbeck Gang. Saint Louis "23" Hold-Ups.

This exhibit (Plate 86) showed photographs of the Federal Judge; U. S. District Attorney; Post Office Inspectors (who were instrumental in convicting this gang), a fake U. S. Post Office Inspector's Badge, revolvers of various patterns, arranged in two concentric circles, with a number of photographs of persons instrumental in running down the St. Louis bandits, and also a picture of the various bandits participating in these holdups, opera glasses, piece of fuse, clips of cartridges and single cartridges, arranged in circles with the revolvers described, an Internal Revenue badge. There is also included in this exhibit photostats comprising the press reports of the bandits and their arrests, convictions, etc.

"Dinty" Colbeck, was the leader of a most desperate gang of bandits, who operated mostly in Missouri. They robbed many post offices, and held up numerous mail trucks. They terrorized the community of St. Louis for a long time before they were captured. They had a rendezvous, just a few miles outside of St. Louis, where they assembled and planned many large robberies. Two and three days a week they had target practice, 3 and 4 hours a day. When Colbeck's home was searched by Post Office Inspectors, they found about $2,000,000 in currency and bonds.

"Chippy" Robinson, a notorious robber and gun-man was Colbeck's "First Lieutenant." It was he whom Colbeck intrusted to accomplish "Big Jobs," as he was known to have wonderful nerve and "Quick on the Trigger." He murdered a man and his wife, who were also members of the gang.

Colbeck and Robinson were captured, convicted and sentenced to serve 40 years each in the Federal Penitentiary at Leavenworth, Kansas. All of the gang were apprehended, tried, convicted and sentenced to prison terms.

A Display Rack of Swinging Frames Showing Photographs of Notorious Postal Offenders, and Charts of Organization Work and Statistics of the Post Office Inspection Service.

This display rack (Plates 87 and 88) containing fourteen wings of swinging frames called leaves.

Leaf No. 1 describes eleven Mail Order Medical Fakes.

Leaves Nos. 2 and 3 contain photographs of Mail Robbers.

Leaves Nos. 4 and 5. Photographs of the De Autremont Brothers and objects connected with the train holdup and murder at Siskiyou,

Oregon, October 11, 1923. All of the brothers were captured in 1927 and are serving life sentences in the penitentiary.

Leaves Nos. 6 and 7 contained the following statistics:

Leaf No. 6. Post Office Inspectors.

1 Chief Inspector
15 Inspectors in Charge of Divisions
520 Inspectors
196 Clerks
113,000 Investigations were made in 1925.

Leaf No. 7. Post Office Inspectors. Criminal Cases. Results of Investigations.

Number of persons arrested in fiscal year 1925 3,696
Number of persons convicted in fiscal year 3,256
Number of persons and firms deprived of mailing privileges. 346

Fate of Mail Robbers

1924	*1925*
1 killed	2 killed
25 sentenced to prison	37 sentenced to prison
13 for 25 years each	1 for 50 years
1 for 10 years	17 for 25 years each
5 for 7 years each	7 for 15 years each
1 for 4 years	3 for 12 years each
1 for 2 years	1 for 10 years
3 for 8 months each	1 for 8 years
	1 for 3 years
	4 for 2 years each
	1 for 1 year and 1 day
	1 for 60 days
Aggregate sentences ....383 years	Aggregate sentences ...646 years
Average sentence ..... 15 years	Average sentence ..... 17 years

Losses in the Mails.

Year	*Recoveries in cases of negligence or theft*	*Losses and recoveries in cases of banditry* *Losses*	*Recoveries*
1921	$2,230,714	$6,198,132	$3,151,017
1922	1,678,492	2,575,107	1,465,548
1923	2,216,249	2,500,574	2,303,794
1924	2,331,793	2,509,157	1,487,444
1925	2,186,993	286,942	128,848
Totals	$10,644,241	$14,069,912	$8,516,651

PLATE 88.—Display rack showing pictures of "Notorious Postal Offenders."

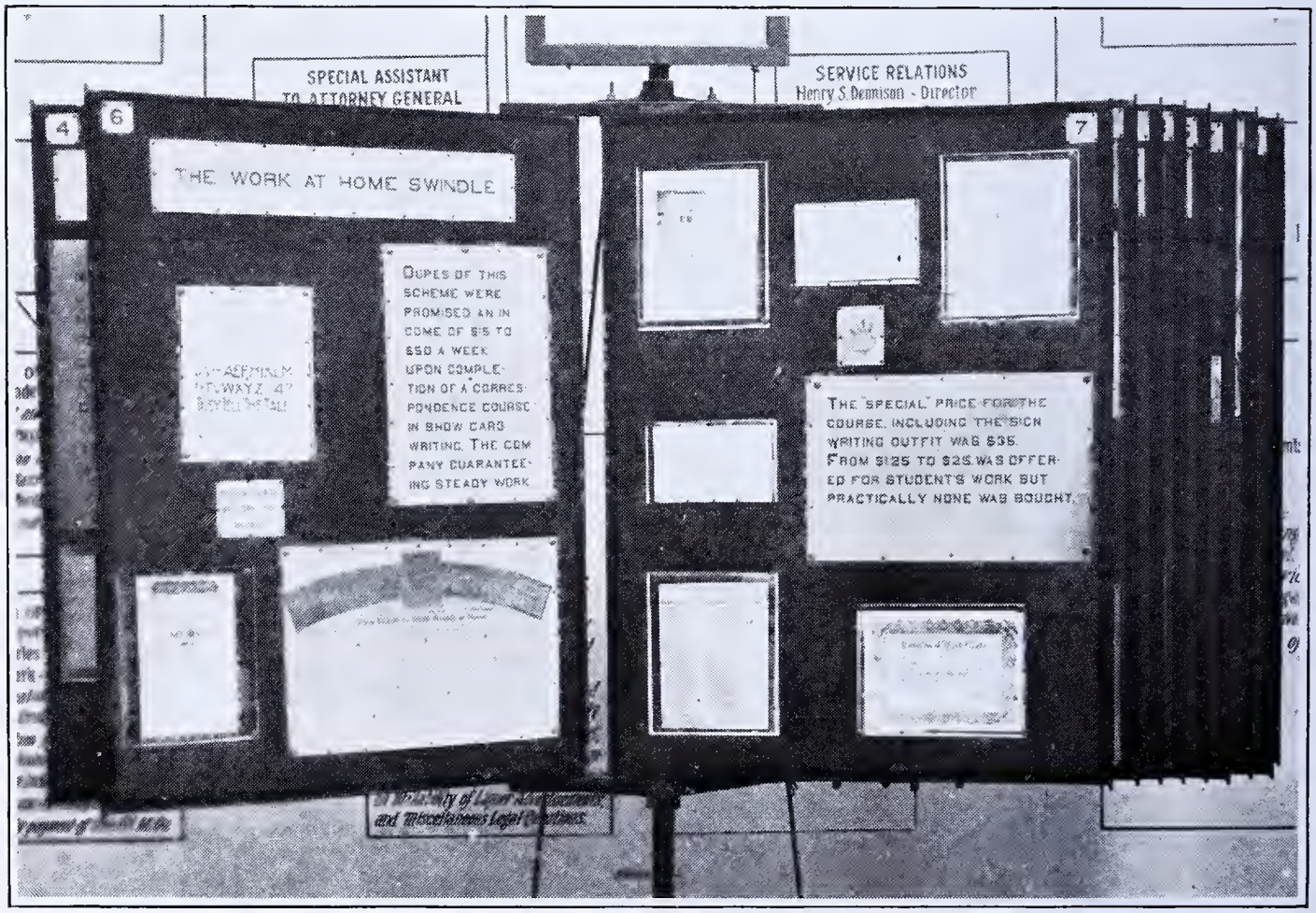

PLATE 89.—Display rack of "Mail Frauds."

Leaves Nos. 8 to 14. Photographs of Mail Bandits, Post Office Robbers, Burglars, and Notorious Post Office Offenders.

A Display Rack of Swinging Frames Showing Mail Frauds and Pictures and Facts Concerning Fraudulent Schemes.

This display contained twenty-four wings or leaves. (Plate 89).

Leaf No. 1. Solicitor Post Office Department.

Fraud Orders were issued closing the mails to 1,437 persons and concerns engaged in fraudulent enterprises, between March 4, 1921, and June 1, 1926.

Leaf No. 2. What is a Fraud Order?

On this leaf the nature of a *"Fraud Order"* is explained and the required duties of Postmasters when such orders are issued.

Leaves Nos. 3 to 24 contain descriptions of various fraudulent uses of the mail, mostly relating to fake or patent medicine frauds.

A Triangle of Three Paintings Showing the "Okesa Train Robbery"

A Triangle of Three Paintings Showing the "Rondout Holdup"

A Miniature Model of Horse-Drawn Mail Vehicle Known as "Screen Wagon." (Plate 90).

The Exhibit of the Motor Vehicle Service Consisting of a One-Half Ton Truck, Also Tires and Tubes.

A Post Office Department Organization Chart (1926).

An Alaskan Dog Sledge and Equipment for U. S. Mail Service.

This dog sledge will carry about 700 pounds of mail. When greater weight has to be moved two sledges are used, one coupled behind the other. This sledge has been used on various routes from 1918 to 1924, and has traveled a total of 19,420 miles, drawn by from 19 to 25 dogs according to the weight of mail carried. The average dog can draw about 40 pounds of mail 25 miles a day. Moccasins or boots are used on the dog's feet in extremely cold weather and in the spring, to protect their feet from sharp ice. The contractor who furnished this sledge used 1,400 moccasins on his dogs during the past winter. This type of sledge is used in transporting the mails to interior and northern points in Alaska during the winter season.

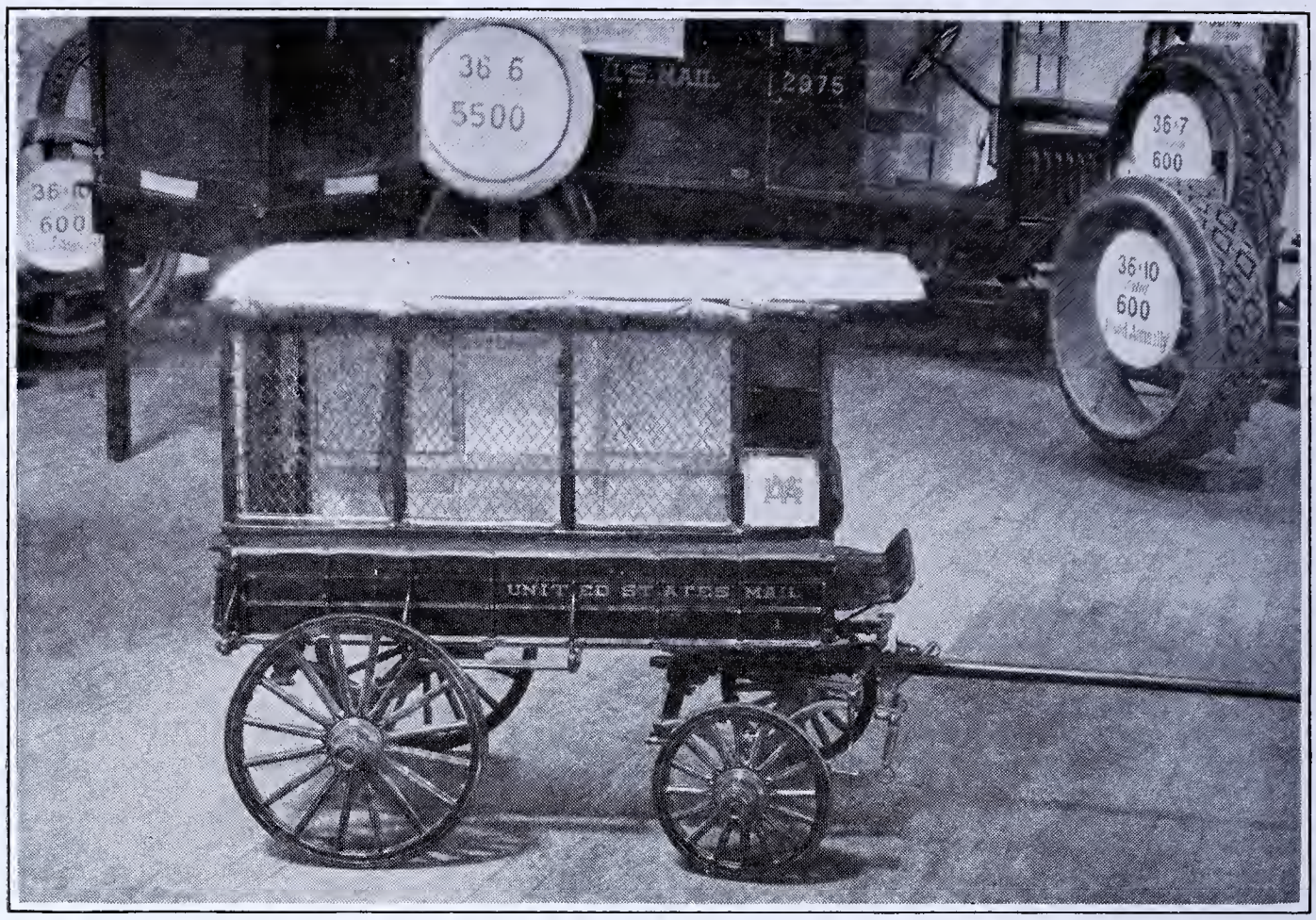

PLATE 90.—Model of a screen wagon, motor vehicle truck and tires.

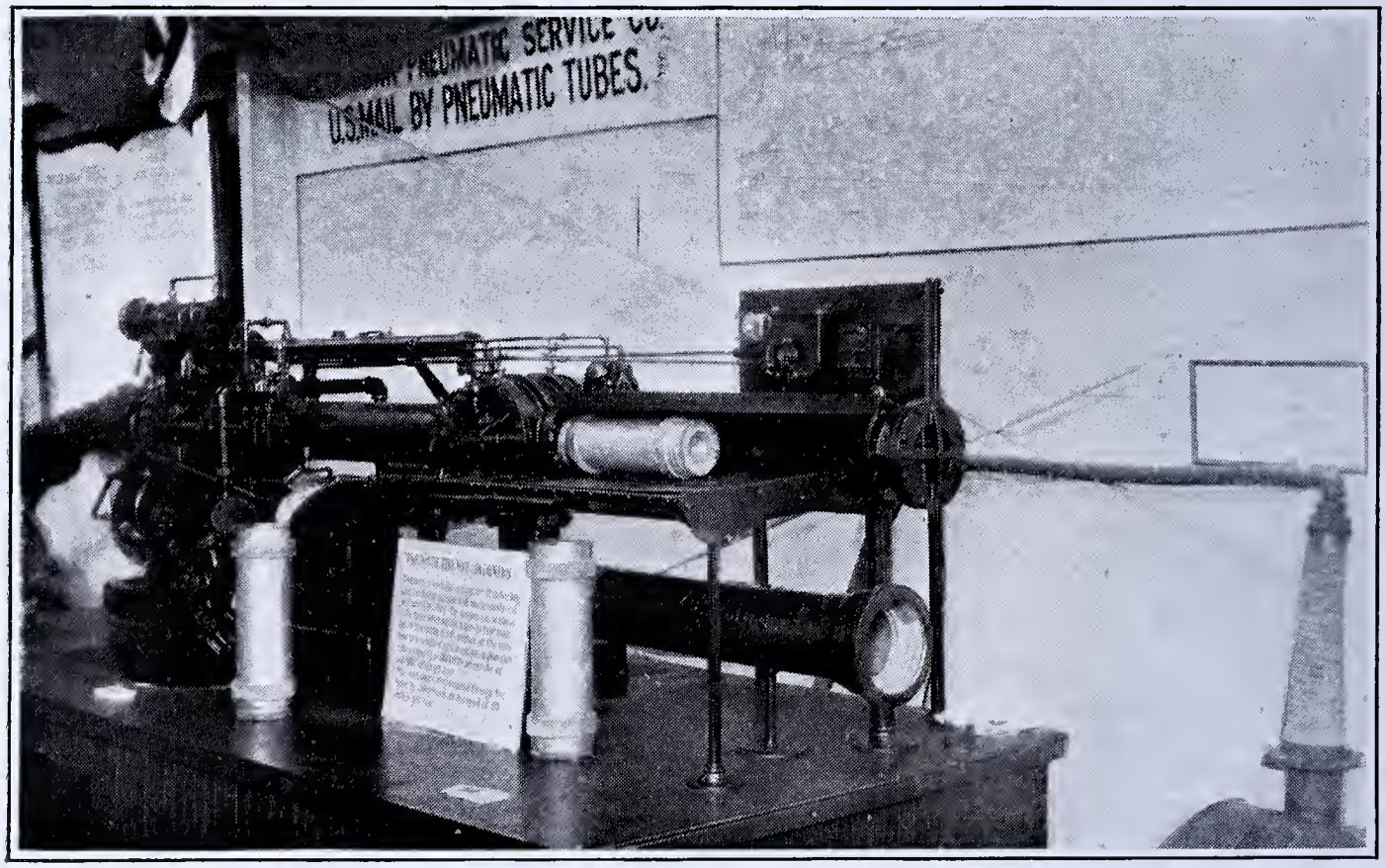

PLATE 91.—Pneumatic tube, containers and air compressor.

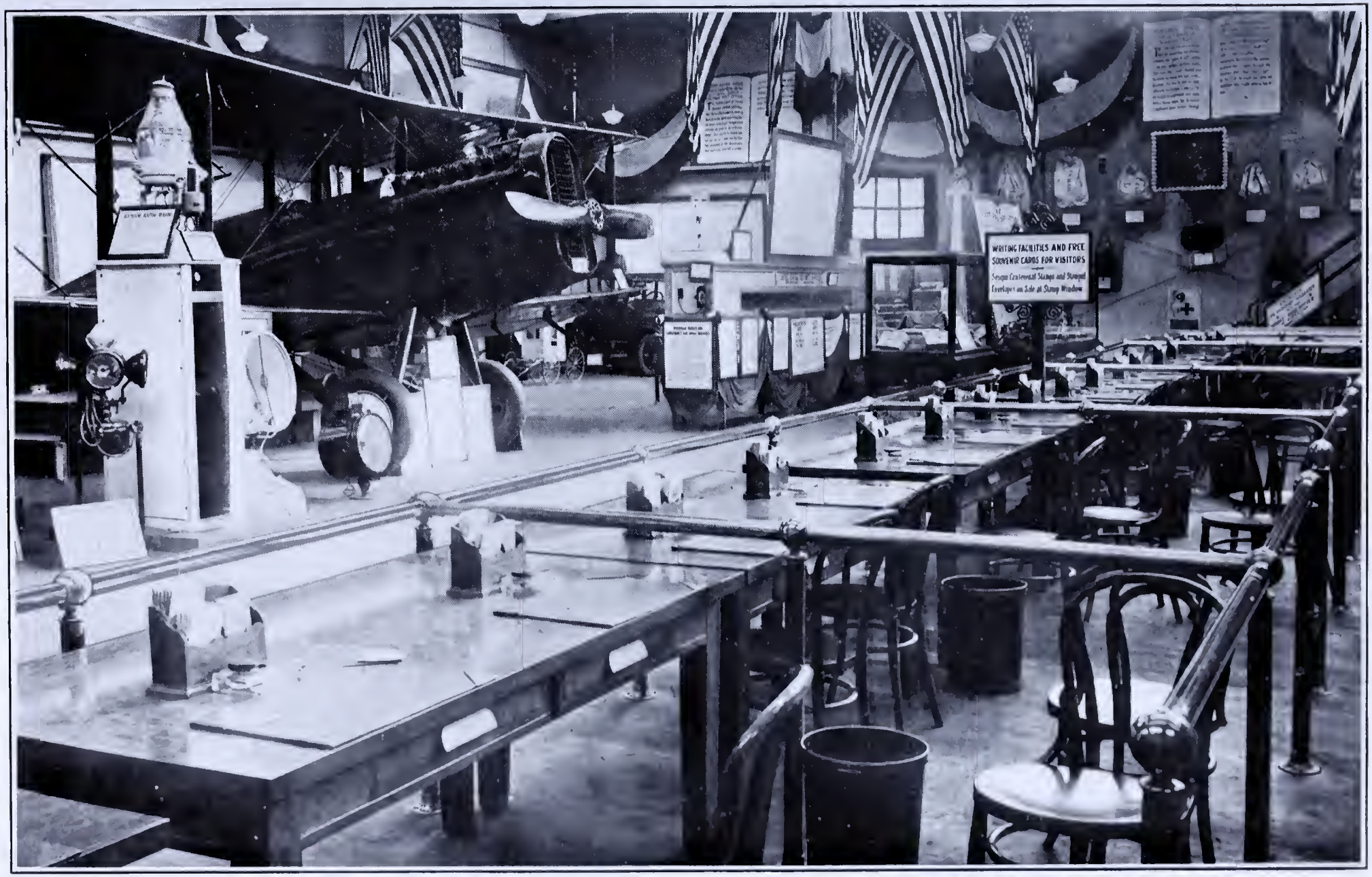

PLATE 92.—View of Air Mail Service exhibit; in foreground writing desks provided for the use of visitors.

A Pneumatic Tube, Containers, Tubes in Racks, Underground Electric Monorail Car, Air Compressor and Map Showing Tube Routes.

This exhibit (Plate 91) showed containers in which mail is placed for transmitting and receiving. The containers are 21″ long and 7″ in diameter (inside measurements), and will hold 400 letters. The containers can be placed in the tubes, which are laid in pairs so that mail can be transmitted in both directions at the same time, at intervals of 8 seconds, which give each tube a capacity of 3,000 letters per minute, or 180,000 letters per hour. The containers are transmitted through the tubes by compressed air at a speed of 30 miles per hour. This system, at the present time, is in operation in New York City and Boston, Mass.

Air Mail Service

This exhibit (Plate 92) showed U. S. Air Mail Airplane No. 330, boundary lights, acetylene beacon, automatic thermostatic beacon light, search lights, air mail radio, electrically controlled view of model Transcontinental Air Mail Route, map of Air Mail Service, parachute flares, portable beacon and a Liberty Aviation Motor (disassembled).

The transcontinental air mail route is divided into three zones as follows: first zone, New York to Chicago; second zone, Chicago to Cheyenne, Wyoming; third zone, Cheyenne, Wyoming, to San Francisco. The postage rate is eight cents per ounce or fraction for each zone, twenty-four cents for the entire route. The rate is ten cents on the overnight New York-Chicago service.

Overnight New York-Chicago Service: In addition to the transcontinental service there is also service at night between New York and Chicago on a daily schedule. A plane leaves the New York Terminal at 9.30 p. m., and is scheduled to arrive at Chicago at 6.45 a. m. A plane also leaves Chicago at 7.30 p. m., and arrives at New York at 4.45 a. m. Transcontinental route—New York to San Francisco, 2662 miles. Lighted airway—New York to Salt Lake City, 2,041 miles. Twelve feeder lines totalling 5,320 miles (operated under private contracts) connect with the Government operated transcontinental route.

Government Operated Air Mail Service: The Government operated Air Mail Service extends from New York, N. Y., to San Francisco, California, by way of Chicago, Illinois, and Omaha, Nebraska. Planes leave each terminal daily in the forenoon arriving at the outer terminal at 5 p. m. the day following. The route is lighted between New York and Salt Lake City and the planes fly at night as well as during the daylight hours.

Transcontinental Air Mail Service: The transcontinental service

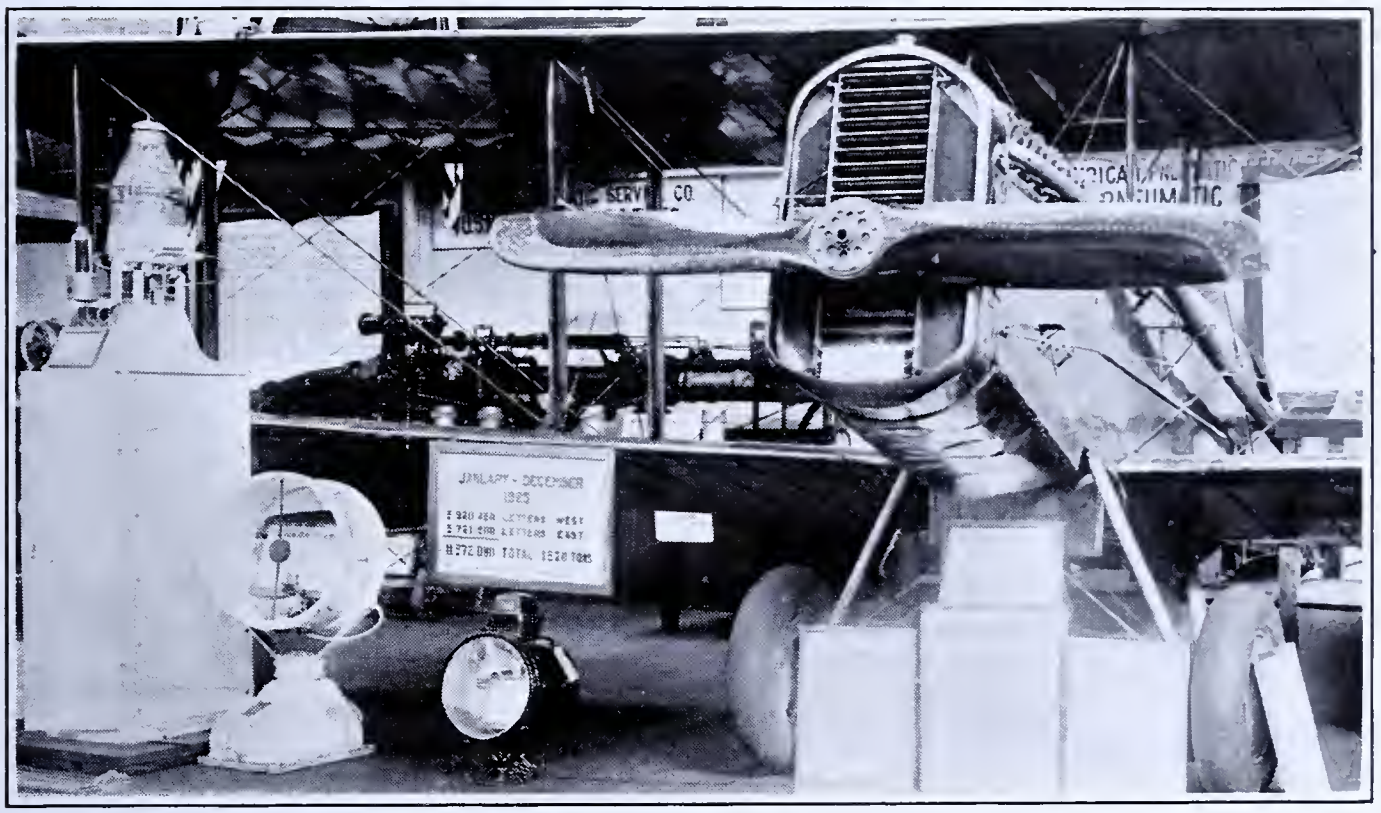

PLATE 93.—View of the Airplane No. 330; acetylene beacon and search lights.

connects with the Cleveland and Detroit contract route at Cleveland, the Detroit and Chicago route at Chicago, and the Cheyenne and Pueblo route at Cheyenne, the Salt Lake City and Los Angeles route at Salt Lake City, the Elko, Nevada, and Pasco, Washington, route at Elko and the Seattle and Los Angeles route at San Francisco.

Air Mail Flying Record for Past Year: From January 1st to December 31st, 1925, the pilots of the Air Mail Service flew 1,681,350 miles in the daytime and 839,044 at night or a total of 2,520,394 miles for the year. The planes that are used on the night flying portion of the route must have special equipment for this service. They have running or navigation lights similar to those used by ships at sea, a red light on the left wing and a green light on the right wing and a white light on the tail. A landing light is mounted on each wing tip, each light having approximately 150,000 beam candle power. The instruments in the cockpit are painted with luminous paint and in addition small electric lights are provided to illuminate the instrument board and compass.

Plane Number 330: This type of plane (Plate 93) has been in use on the transcontinental Government operated air mail route since the inauguration of that service. It is a reconstructed De Haviland, completed at Repair Depot, Maywood, Illinois, November 10, 1923. Number of hours flown, 575, night 450, total 1,025; number of miles flown, day 57,500, night 42,750, total 100,250; number of pounds carried, day 24,750, night 19,200, total 43,950; number of pieces carried, day 990,000, night 768,000, total 1,758,000. Forced landings, weather 7, mechanical 3. Original set of panels changed, otherwise original plane is intact. Plane has been flown by Pilot W. D. Williams on practically all mail flights. Ship has never had any "crackups" of any kind.

Special Plane Assigned to Each Pilot: It required four or five pilots to keep up the service on the transcontinental route. In addition to the pilots it is necessary to have mechanics and mechanics' helpers at all regular fields to check up the planes and motors, make necessary repairs and service the planes when stops are made. The mail is transferred from one plane to another at six different points on the route. Pilots change at each transfer point. Each pilot has a plane assigned for his exclusive use in so far as this is practicable.

Night Air Mail Service Between New York and Chicago: The overnight New York-Chicago service makes direct connections with the Chicago-St. Louis contract route at Chicago. The Chicago-Dallas route at Chicago, and the Chicago-Minneapolis route at Chicago, giving eastern seaboard points in the vicinity of Philadelphia, New York and Boston eighteen to twenty-four hours service with all points on these

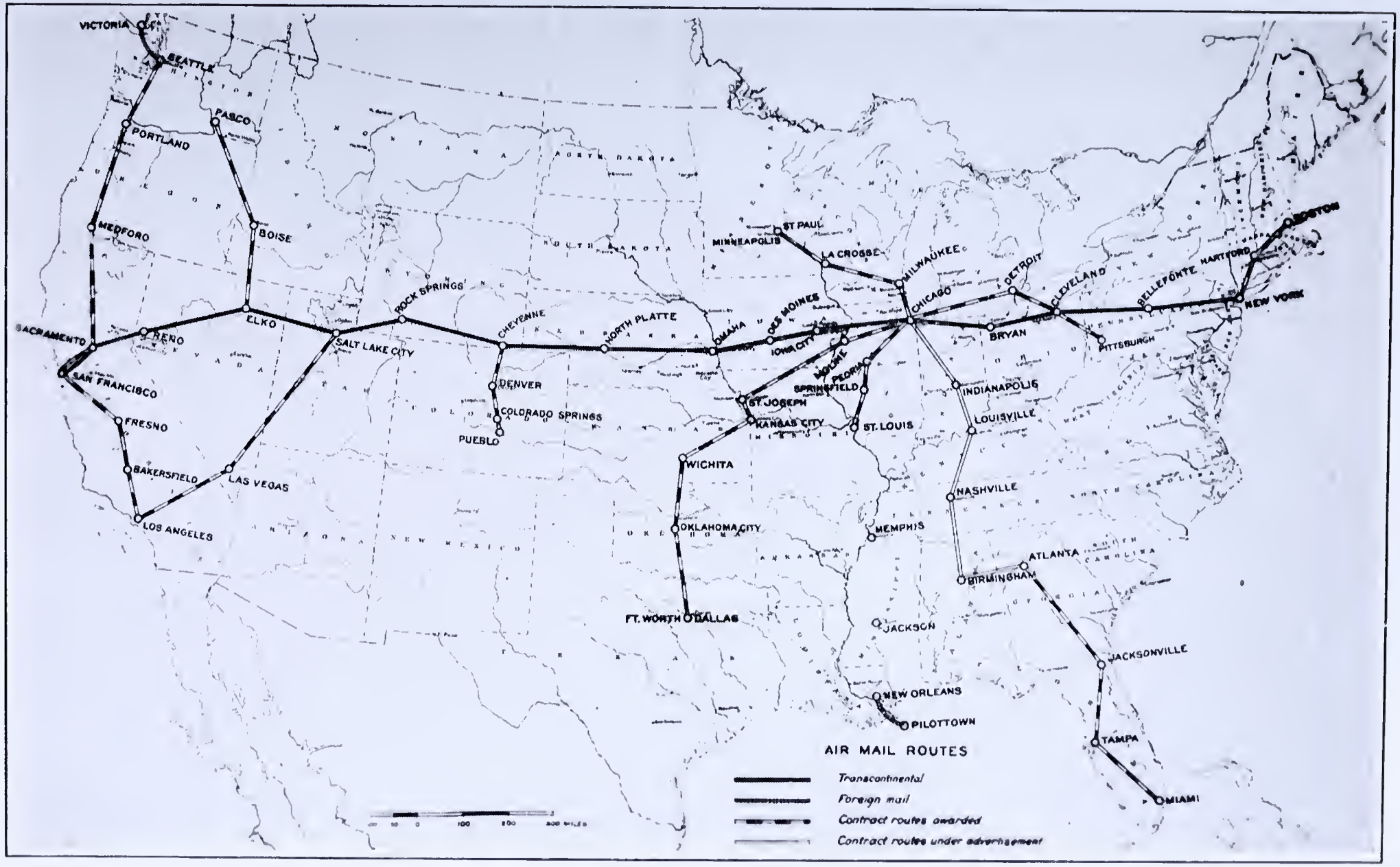

PLATE 94.—Air Mail Routes in the United States.

routes and territory adjacent thereto, saving a business day in the transportation of mail between such points.

Parachute Flares: Two flares are regular equipment on all night flying planes. Mounted in fuselage behind pilot these flares when released by lever in pilot's cockpit at approximately one thousand feet altitude light up ground to make forced landing at night. In clear weather a flare lights up about one square mile of the earth's surface while suspended in air by an eighteen foot silk parachute. The parachute descends at rate of about two hundred feet per minute and the flare burns four minutes. Pulling lever releases magenesium candle and parachute to which candle is attached and the opening of chute ignites flare by means of percussion cap and small amount of gun powder.

Wing Tip Landing Lights: One on each lower wing tip of each night flying plane. Same use as headlights on automobile. Each uses 35 amperes at 12 volts. Develops 50,000 beam candle power. In clear weather lights up 3,000 feet.

U. S. Air Mail Map of United States: Showing all Air Mail routes in the United States. (Plate 94).

Electrically Controlled Panoramic View Case of Air Mail Service: This is to represent the daily flight of mail planes across the continent. One plane leaves San Francisco at 9 a. m. and reaches Cheyenne, Wyoming, at 8.40 p. m., then makes a night flight through to Chicago. Leaves Chicago at 8 a. m. then arrives in New York at 5 p. m. A special service is conducted between Chicago and New York, leaving Chicago at 9 p. m., arriving at New York in eight hours fifty-five minutes. The services are conducted daily westward from New York. The westbound night plane from New York makes connections at Chicago for commercial airplane mail routes to Minneapolis, St. Louis and Dallas, Texas. The regular transcontinental day flight from New York makes connections from Cleveland to Detroit and other Michigan points, at Cheyenne, Wyoming, for Denver and other Colorado points, at Salt Lake City for southern Nevada and Southern California points, at Elko, Nevada, with the Pacific Northwest, then to San Francisco, making connections with central California points. Each light indicated on the map represents a beacon light of 5,000,000 candle power, showing the pilot the airway. Since this map was made up the airway has been extended from Cheyenne to Salt Lake City, thus making this the longest lighted airway in the world. The Government operated airway together with the various commercial connections makes the longest daily airplane service in the world. The fastest railroad time between New

York and San Francisco is 96 hours. The regular Air Mail Service schedule between these points is 34 hours.

Sun Valve: Turns beacons (acetylene and electric) off at daylight and on at dark. Acetylene entirely automatic, requiring no attention. Sunlight opens circuit on valve and darkness closes it.

Floodlight: Floodlight for terminal fields. Semi-circular beam may be set at prearranged elevation so it extends only a few feet above the ground. Set on one side of field, illuminates entire field. Sixteen in service.

Tork Clock: Turns beacon (electric) on and off at prearranged times. Must be wound every eight days.

Postage Rates on Contract Air Mail Routes: The postage rate on the Contract Air Mail routes is ten cents an ounce or fraction thereof for routes not in excess of one thousand miles in length, fifteen cents an ounce or fraction thereof for routes exceeding one thousand miles, but not exceeding 1,500 miles and twenty cents an ounce or fraction thereof for routes exceeding 1,500 miles in length, direct air mileage to control in each distance. The rate of postage for mail carried on the Government operated route received from or dispatched to a Contract Air Mail route is five cents an ounce or fraction thereof for each zone of the Government operated route over which the mail is carried. This is in addition to postage required on contract routes.

10,000 *Watt Incandescent Lamp*: Largest incandescent lamp in use. Draws approximately 90 amperes at 110 volts. Used in floodlights and beacons.

Compass Lamp: Smallest incandescent lamp in our service. Lights compass dial of night flying ships. Draws 1/10 ampere at 12 volts. 1000 watt, 110 volt, Stereopticon type bulb used in revolving beacons—5,000,000 beam candle power. 12 volt, 35 amperes Headlight type bulb used in plane wing tip—500,000 beam candle power. 900 watt, 32 volt Stereopticon type bulb used in revolving beacons—5,000,000 beam candle power.

Radio Used in Air Mail Service: The transcontinental route is equipped with powerful radio transmitting and receiving sets at all regular and terminal fields. At all stations in the light portion of the airway New York to Salt Lake City, operators are on duty twenty-four hours daily. At stations between Salt Lake City and San Francisco sixteen hour service is maintained. The continental code is used. The radio is used in transmitting weather reports, in reporting plane movements and in communication between fields.

Twenty-four Inch Rotating Beacon: Operates from current supplied by power companies, gasoline electric house lighting plants and

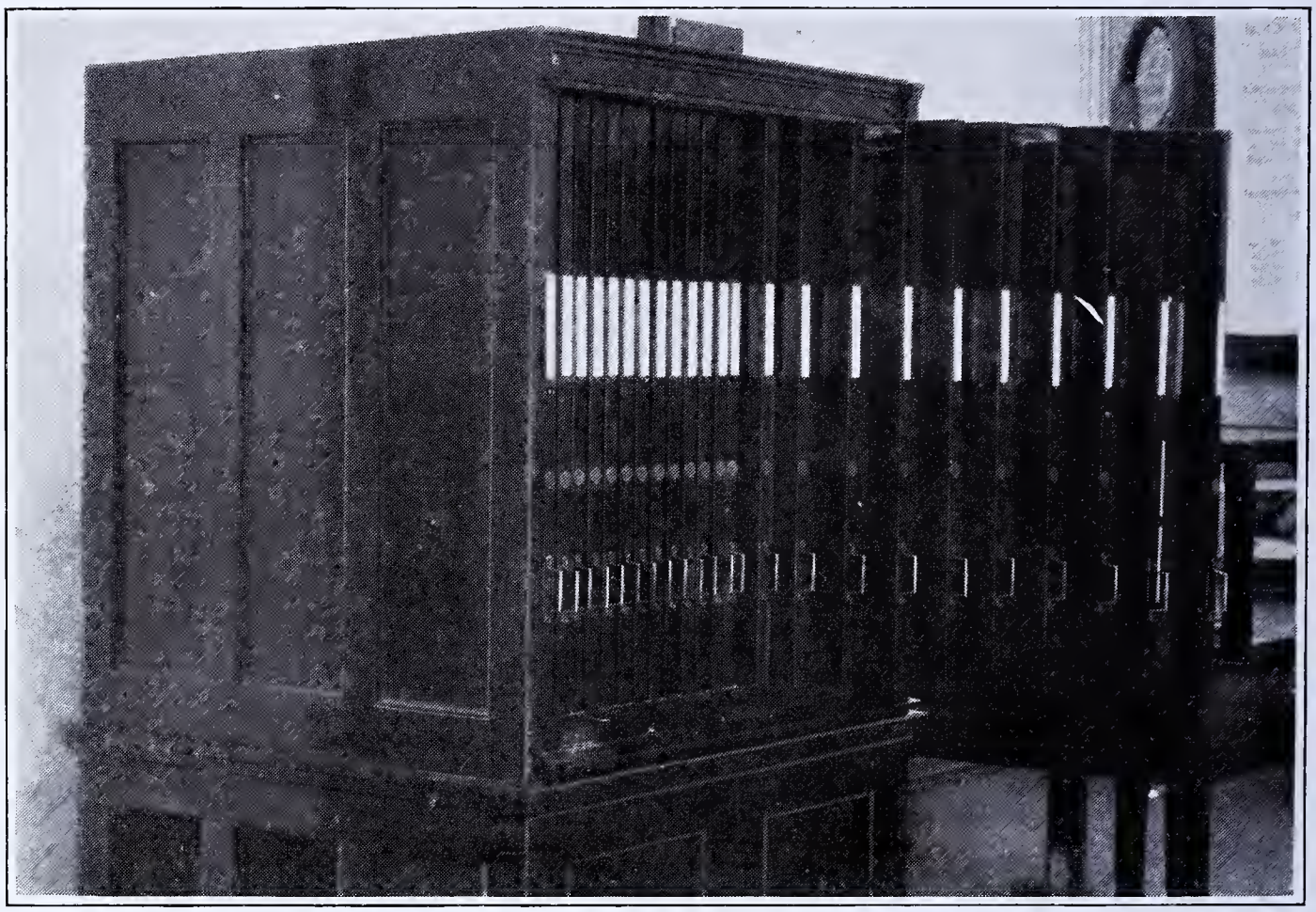

PLATE 95.—Philatelic Display Case containing U. S. Postage Stamps of the past and present issues.

wind driven aeroelectric plants. Mounted on windmill towers to clear all surrounding obstacles. Rotates six times per minute by means of electric motor in base. Visibility 75 miles in clear weather. Set at angle of one-half of one degree above horizon. Beam candle power 5,000,000. One hundred thirty-four in service.

Ceiling Indicator: Set at angle of forty-five degrees indicates by light on clouds height of clouds above ground. Point on ground directly beneath light is same distance in feet from light source as the clouds are overhead. Indicates ceiling up to two thousand feet.

Scale Model of De Haviland Mail Plane. Liberty Aviation Motor Disassembled: Stroke 7″, Bore 5″, 425 horsepower. Used by Post Office Department, United States Army, Navy, Marine Corps.

Boundary Lights: These boundary lights are used on emergency fields to indicate boundary of the field approximately sixteen to each field. They are operated by Edison primary cells.

Rotating Cluster Beacon: Operation and use same as twenty-four inch beacon, develops 50,000 candle power beam. Visibility in clear weather twenty-five miles.

Acetylene Routing Beacon: Burns acetylene gas. Number of flashes can be regulated—usually set for seventy-five. Located approximately every five miles along lighted airway. Have two-fold use, (a) routing beacon, (b) possible emergency field marker. Four hundred and thirty-four are in service. Note: Two types were on exhibit, A G A and Interflash.

A Philatelic Display Case Containing United States Postage Stamps and Other Stamped Paper of the Past and Present Issues. (Plate 95).

A Case Containing Various Articles Lost in the Mails Through Improper Wrapping and Addressing

A Case Showing "How and How Not to Wrap Parcels." (Plate 96).

This exhibit showed that the wrapping paper or container used should be sufficiently strong to prevent damage to or loss of contents. Tie securely with stout cord. Address should be legible and complete. Put your name and return address on it. These parcels picked from the accumulation of undeliverable parcels on hand in the Division of Dead Letters and Dead Parcel Post, Washington, D. C., illustrates the *wrong* way to prepare parcels for mailing, and they tell the reason for 810,336 undeliverable parcels being sent to the Dead Parcel Post Offices last year.

PLATE 96.—"How and How Not to Wrap Parcels."

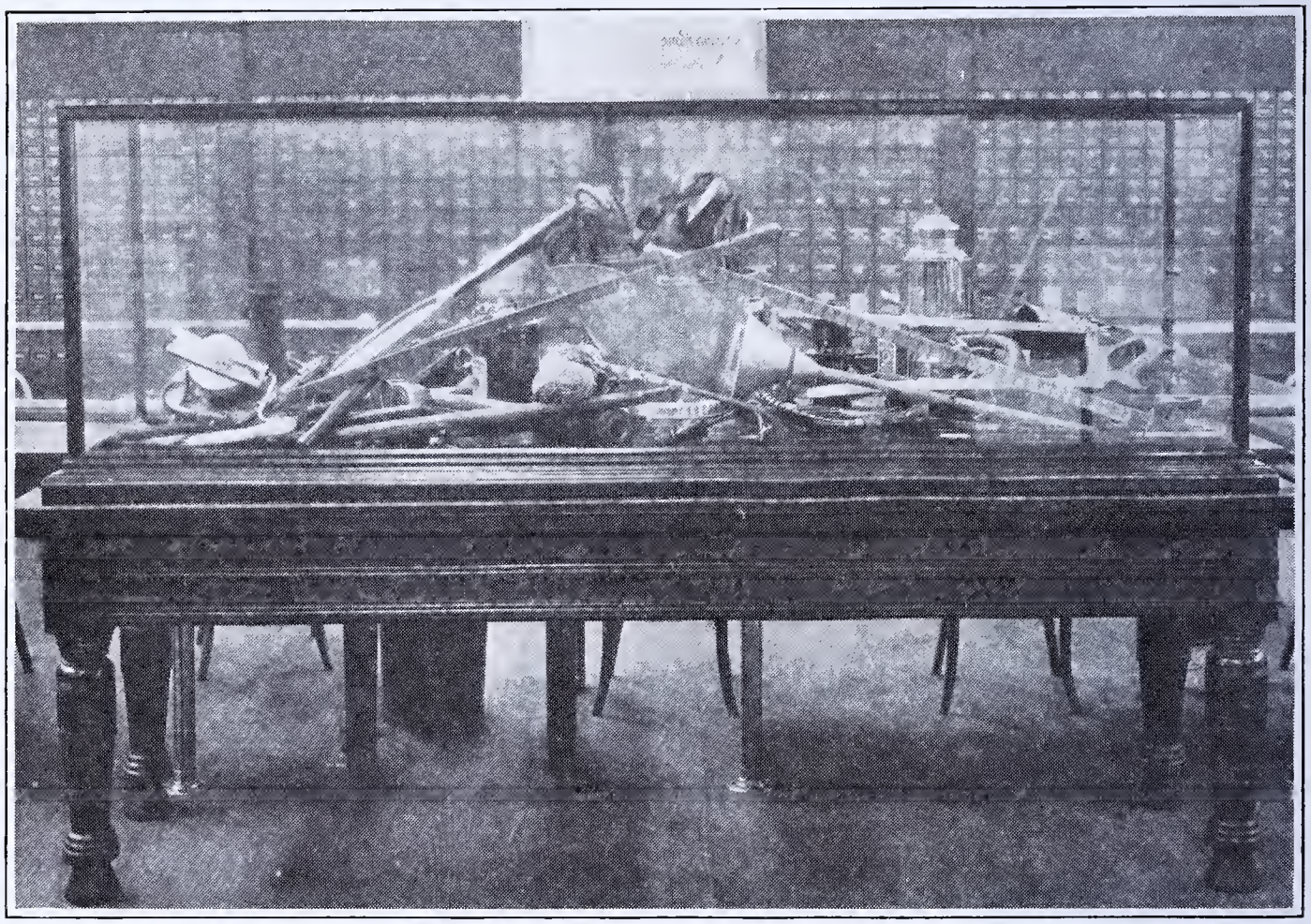

PLATE 97.—Case containing articles lost in the mails.

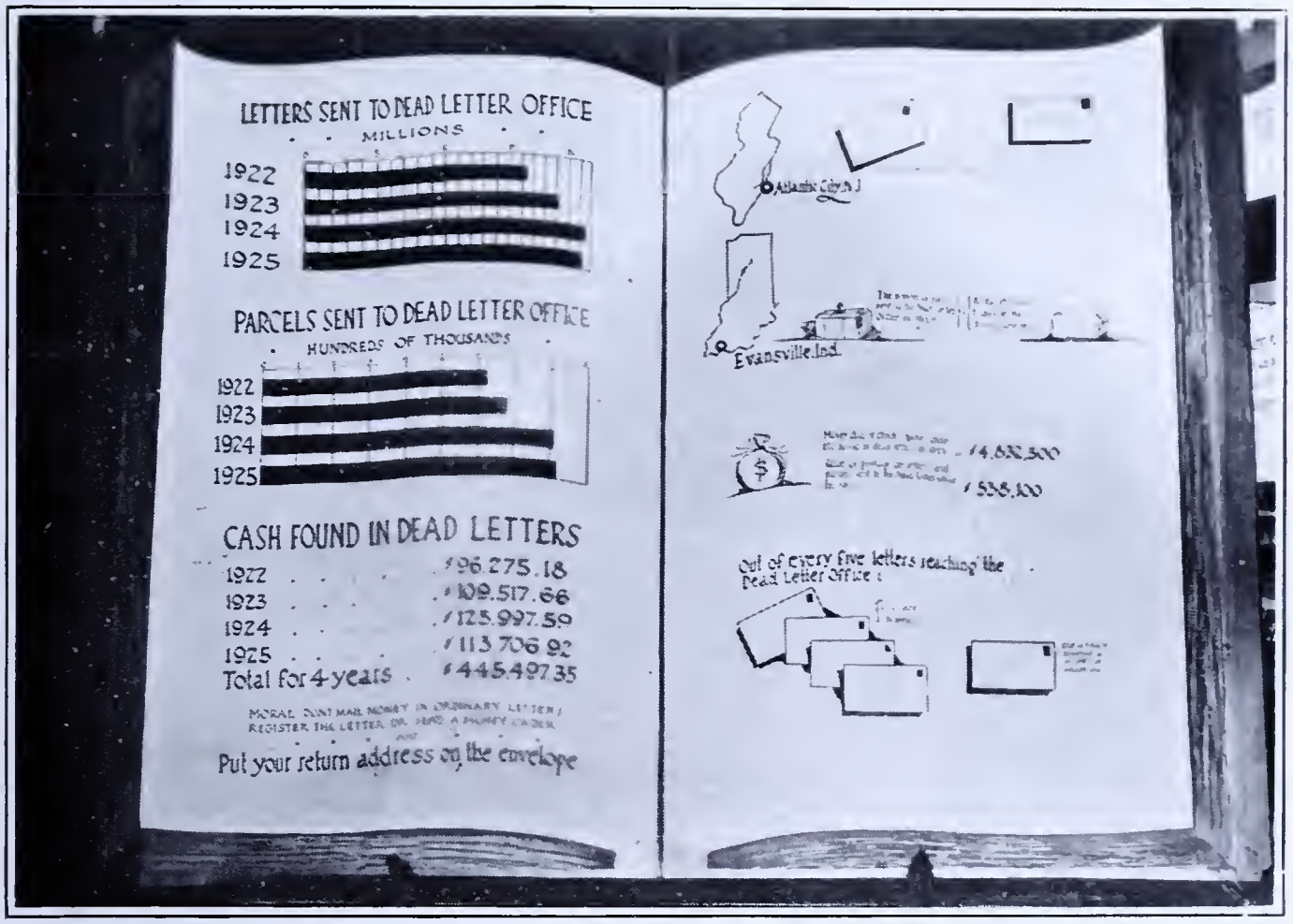

PLATE 98.—Dead Letter Office display easel.

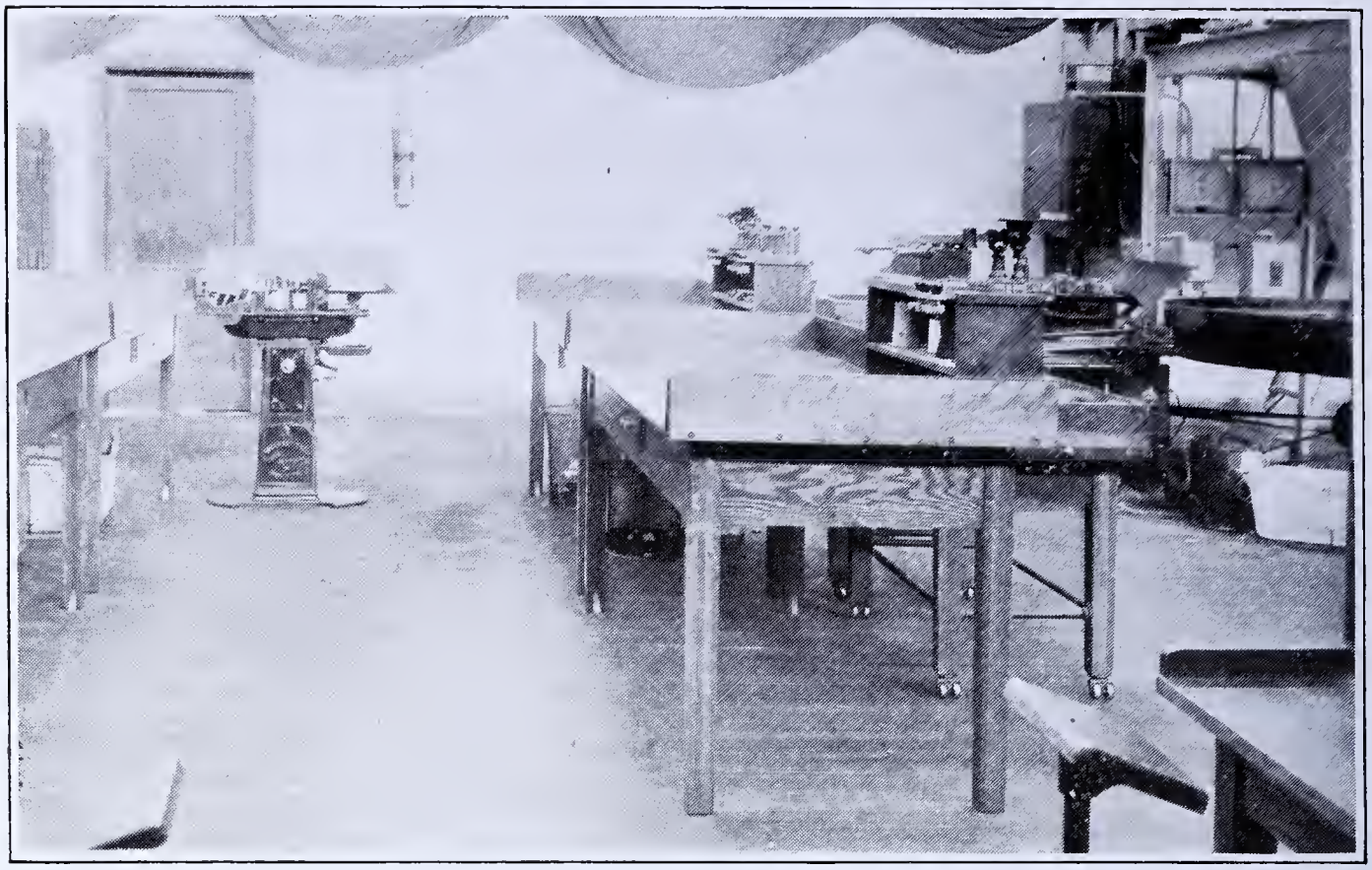

PLATE 99.—Interior of the Model Post Office—North Aisle—Cancelling Machine—Swing Room in rear.

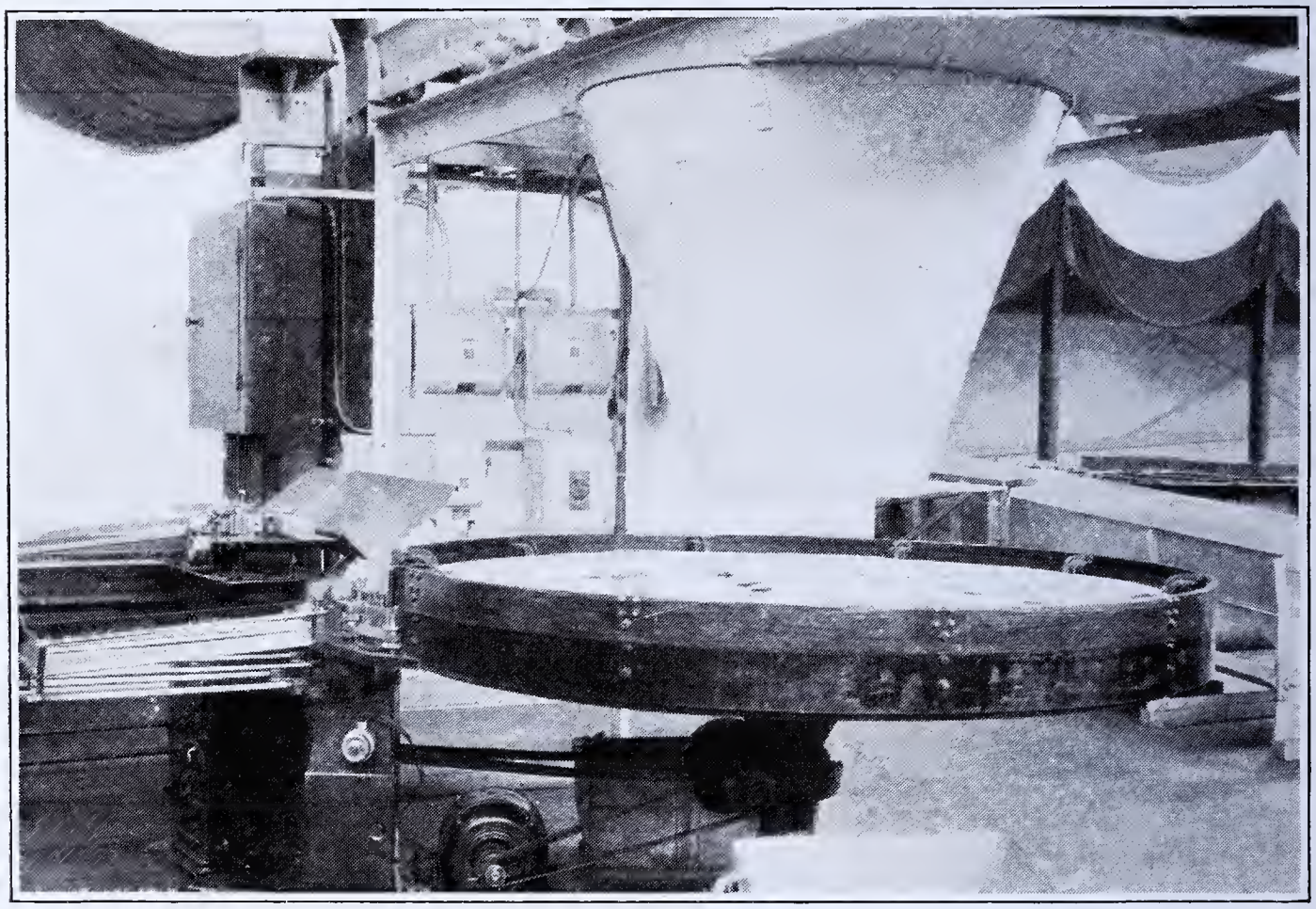

PLATE 100.—Interior of the Model Post Office—"Facing-up" Table and Cancelling Machine.

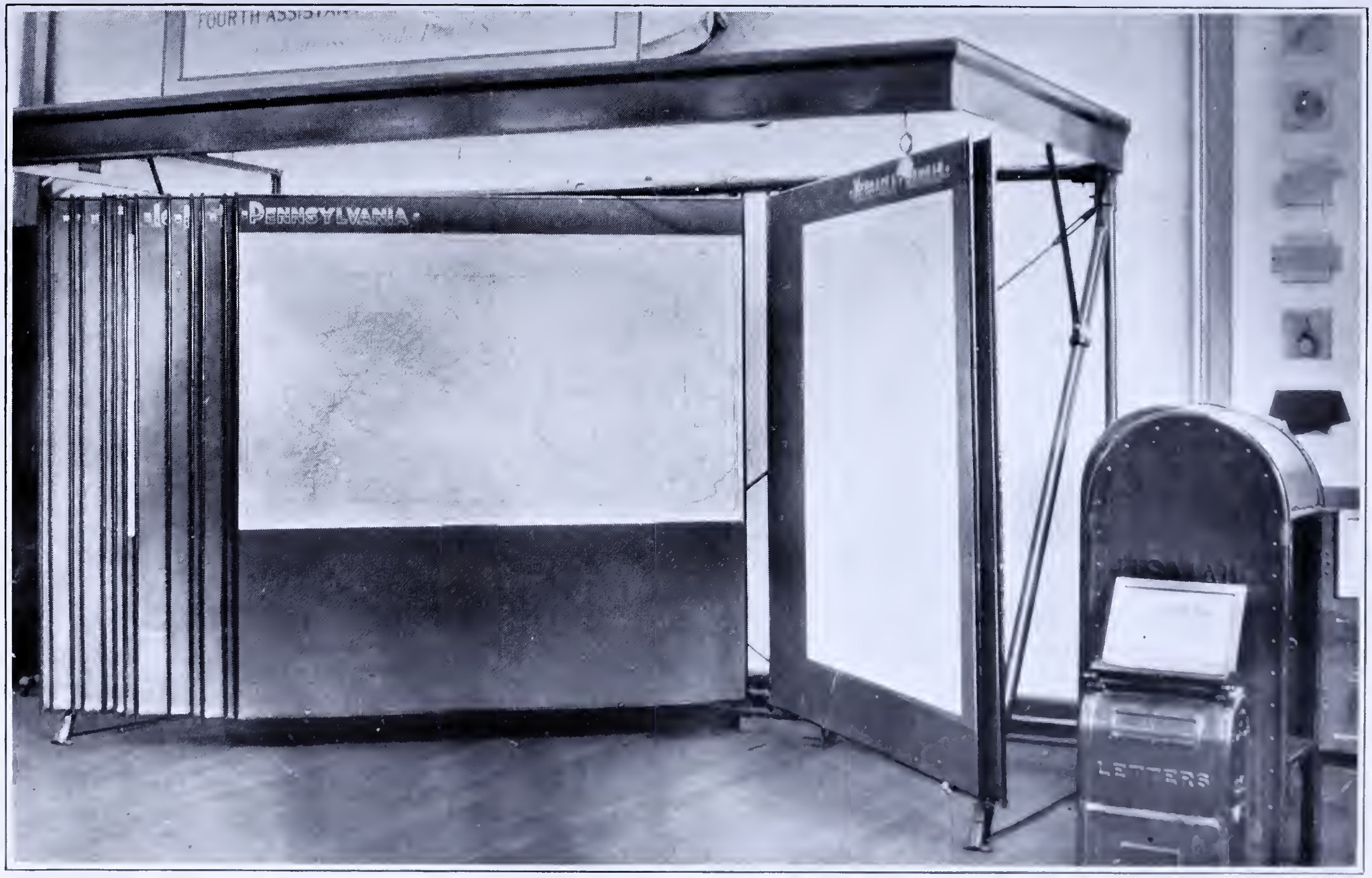

PLATE 101.—Post Route Map display rack, fifteen wings, with rural maps of each state.

A Case Containing Articles Lost in the Mails. (Plate 97).

A Dead Letter Office Display Easel.

This exhibit (Plate 98) showed that over 21 millions (21,000,000) undeliverable letters went to the Dead Letter Office last year, representing a loss of more than $750,000. A typical dead letter showing the reasons why letters fail to reach intended recipients or to be returned to writers, as follows:

No such post office named.
Held for postage.
Misdirected or incorrectly addressed.
No address. (100,000 a year).
Incomplete address.
Illegible writing.

Unmailable. A window envelope is unmailable without same bears the return card of the sender. Stamps cut from stamped envelopes are not permissible for use.

Cancelling Machine and Collection Letter Box

Mail deposited in the letter box was cancelled through the cancelling machine every thirty minutes on the hour and half hour. (Plates 99 and 100).

A Display Rack of Various Forms Used in the Postal Service

A Post Route Map Display Rack, Fifteen Wings, With Rural Maps of Each State. (Plate 101).

Rural Delivery Service

One type of vehicle used for rural delivery service was exhibited and rural delivery collection boxes of various types. Motion picture machine showed delivery and collection of mail on rural route, etc. Rural delivery chart of statistics. Different kinds of mail sacks, pouches and satchels used in the service. Chart of "A few of the supplies used in the Postal Service." Model of obsolete rural delivery horse-drawn vehicle.

There are 7,500,000 mail sacks for transporting parcel post and second class mail in service. The total number of sacks and pouches of all kinds in service for transporting all classes of mail matter, domestic and foreign, is 12,770,000.

A Display Rack of Swinging Frames Showing Photographs of Various Persons and Activities of the Postal Service.

Photographic Ramifications of the Postal Service.

The Staff of the Post Office Department.

Leaves Nos. 2, 3 and 4. Postmaster Generals under Continental Congress, and under the Constitution.

Leaf No. 5. Showing photographs of historical subjects.

Winged Mercury. (Official Seal of the Post Office Department prior to May 1, 1837). Old commission of postmaster. The first post office in San Francisco, California. Fort Dearborn post office—nucleus of the great Chicago, Illinois, post office of today. Cleveland mail—Pony Rider. Overland mail stage coach—1858. Honorable Harry S. New—taking the oath of office as Postmaster General, March 4, 1923. Searsburg, Vermont, post office. Pass Christian fast mail. P. C. Miss. (Mary and John). From mule to airplane. Uncle Sam delivers the goods. 1800—Mail carrier of over 100 years ago. Monument marking place where the first pony express started, on April 3, 1860, St. Joseph, Missouri. Pony express race 1926. Official seal of the Post Office Department—"Post-horse in speed with mail bags and rider, encircled by the words, 'Post Office Department, United States of America,'" May 1, 1837, Amos Kendall, Postmaster General. The old post office at 29 Williams Street, New York City. First post office in Oklahoma. New line of stages. In the days of the Pony Express. Tin Box 9 x 4 x 4 inches, used to carry mail on horseback during the Revolutionary War from Portsmouth to Boston, by Captain John Noble, post-rider.

Leaf No. 6. Showing photographs of Post Offices.

Leaf No. 7. Showing photographs of Rural Delivery and Parcel Post.

Sack of sugar being received by parcel post. From raspberry bush to consumer. Road on rural route in Northern Iowa. Rural carriers. Postmaster General New. Peaches delivered by parcel post. Rural carriers ready to start. Bank of Vernal, Utah, built of brick shipped by parcel post from Salt Lake City. Fleet of automobiles used on rural routes, Indianapolis, Indiana. Mail carrier Iliff's snowmobile. How would you like to be the postman? Average load on Star route from Crescent City, California, to Brookings, Oregon, over 32 miles of mountain roads. View of Star route in Porto Rico. Parcel post carrier loading his truck. Sending chicks by parcel post. Fresh eggs by parcel post. Straggling rural mail boxes. Three-family rural mail box designed to take the place of straggling mail boxes.

Leaf No. 8. Showing Photographs of Air Mail Service.

The Collier trophy. Transcontinental air mail, from San Francisco to New York City, 26 hours, 14 minutes. High power beacon light on emergency field. Plane circling beacon light on emergency field. Sierra Nevada Mountains. Conference of air mail service—Postmaster General New and Second Assistant Glover. Air mail trophies. Douglass M-1 plane now used in the air mail service—Postmaster General New, Earl F. Ward, and Second Assistant Postmaster General Glover. De Haviland type of mail plane equipped for night flying. This type of plane has been used in the Transcontinental Service practically since its inauguration in 1918. Most up-to-date mail plane of the Douglas type, equipped for night flying. Air mail pilot with complete equipment, getting into plane for night flight. United States air mail plane No. 385. Collecting letters from a special air mail letter box. Tribute from Detroit Aviation Society, Transcontinental Air Mail, September, 1923. Air mail box. Night air mail service. Special air mail letter box. Mail planes fly over the Allegheny Mountains each way, twice a day.

Leaf No. 9. Showing photographs of Air Mail Service.

Highest routing beacon in Air Mail Service, Sherman Hill, Wyoming, 8,600 feet above sea level. Air mail routing beacon, equipped with sun-valve. Turns light on at night and off at daylight. Close-up view of sun-valve on routing beacon. Air mail hangar—lighted for night service. Air mail field at night. Boundary marker lights will be noted around border of field. Emergency field boundary light—Air Mail Service. Ford cluster beacon light—Air Mail Service. Field flood light—one-half billion candlepower. A terminal air mail field at night. Wing tip and running lights on night flying air mail plane. Large electric lights are used to light the air mail fields. Loading mail on night plane just prior to departure. The large flood light gives the field a daytime perspective. Making mail exchange at night on Transcontinental Air Mail Route. Huge flood light used to light air mail fields. Two parachute flares are installed in each ship and project under fuselage. A completed parachute flare ready for installation. Air mail night flying on lighted field at night. One of the many beacon lights on the Transcontinental Route.

Leaf. No. 10. *Showing photographs of Post Office requirements—printing post cards, stamps, forms, equipment and other supplies.*

Leaf No. 11. *Showing photographs of Air Mail hangars, terminals, landings, types of machines, etc.*

Leaf No. 12. *Showing photographs of Air Plane Service and equipment.*

Mail plane flying over New York City. Mail plane flying over San Francisco Bay. Wing tip (enlarged) on airplane. East meets West on the plains of Wyoming. Distribution of air mail at Terminal Field. Loading mail plane just prior to its departure from Terminal Field. Field flood light, 500,000,000 candlepower. Landing at an emergency field. Servicing plane at emergency field. Servicing liberty motor. "Broadway Limited" Pennsylvania Railroad—20 hours, New York to Chicago; 18½ hours Philadelphia to Chicago. Air mail plane overtakes the "Overland Limited" in the Sacramento Valley, California. Plane on landing field in the snow. Snow shoes are a part of the pilot's regular equipment during the winter season. Mail plane ready to start with the night mail. Air mail plane fitted with snow shoes. Huge flood light used to light air mail fields on night route.

Leaf No. 13. *Showing photographs of activities in the Post Office, cancelling machines, mail trucks in service, etc.*

Leaf No. 14. *Showing photographs of Railway Mail Service, Twentieth Century Limited, etc.*

A Stamped Envelope Manufacturing Machine Was Exhibited

A demonstration of the operation of this stamped envelope machine was made and which produced No. 5 extra quality stamped envelopes without return card thereon.

Three Automatic Delineascope Machines Were in Operation. The Films Showing Transportation of Mail, Mail Delivery and Many Other Activities of the Postal Service.

Film No. 2. Time, tide and mail trains wait not for man or stenographer. "Let's Go." Modern sixty foot railway post office car used in distributing mail in transit. Interior view of modern railway postal car showing letter cases in end, paper racks on the sides and overhead boxes. Modern railway mail distributing car with letter cases on the sides of center aisle. Close up view of letter distributing cases in up-to-date railway mail car.

Oil Paintings

The following fourteen oil paintings were displayed.

"*Uncle Sam.*"—Picture of Uncle Sam holding a large letter and leaping or hopping over the world.

"*Rural Mail Carrier—Winter Equipment.*"—Winter snow scene of rural mail two-horse conveyance on runners.

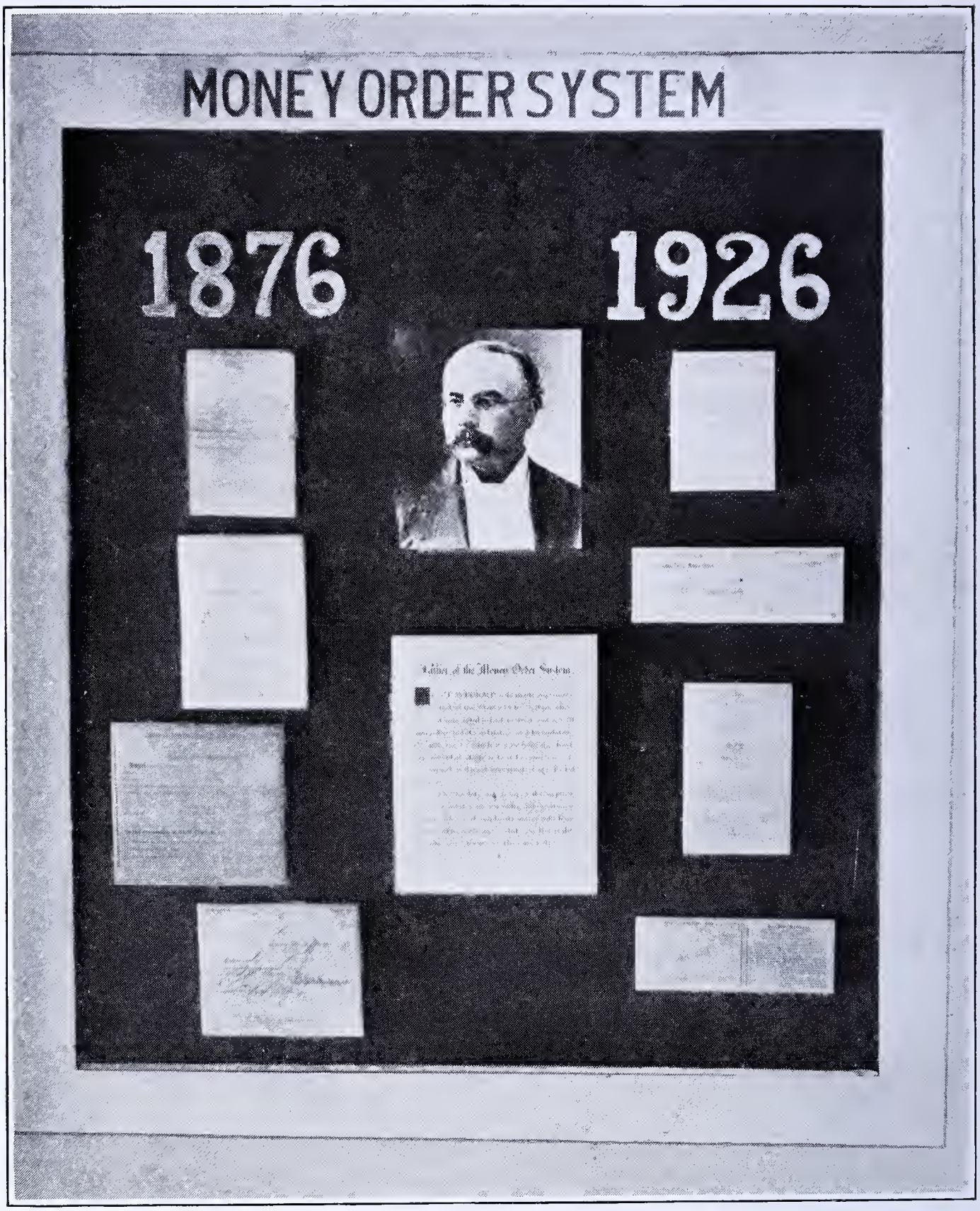

PLATE 102.—"Money Order System—1876-1926"—Picture of the "Father of the Money Order System"; money order blanks used in 1876 and in 1926.

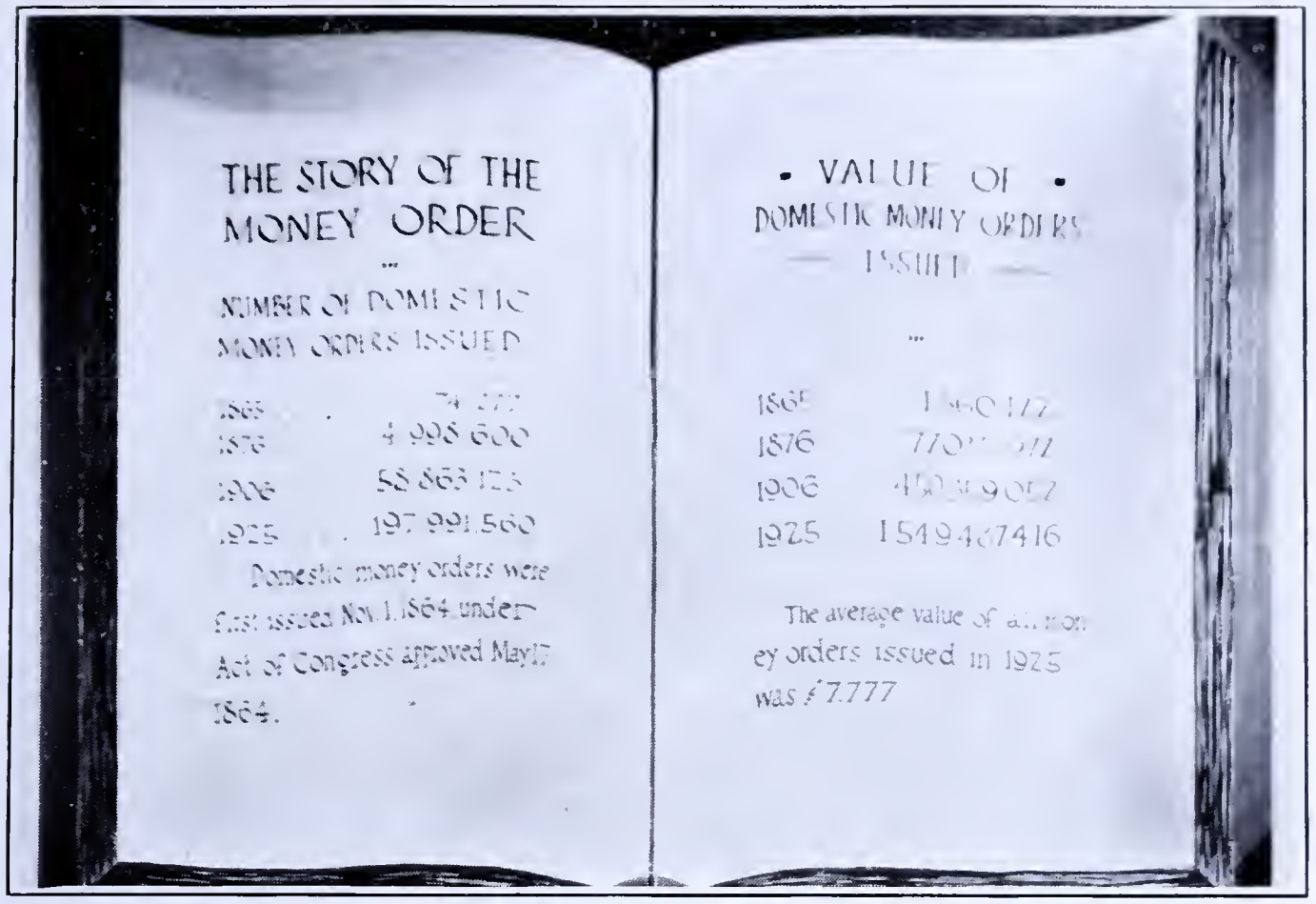

PLATE 103.—"Story of the Money Order."

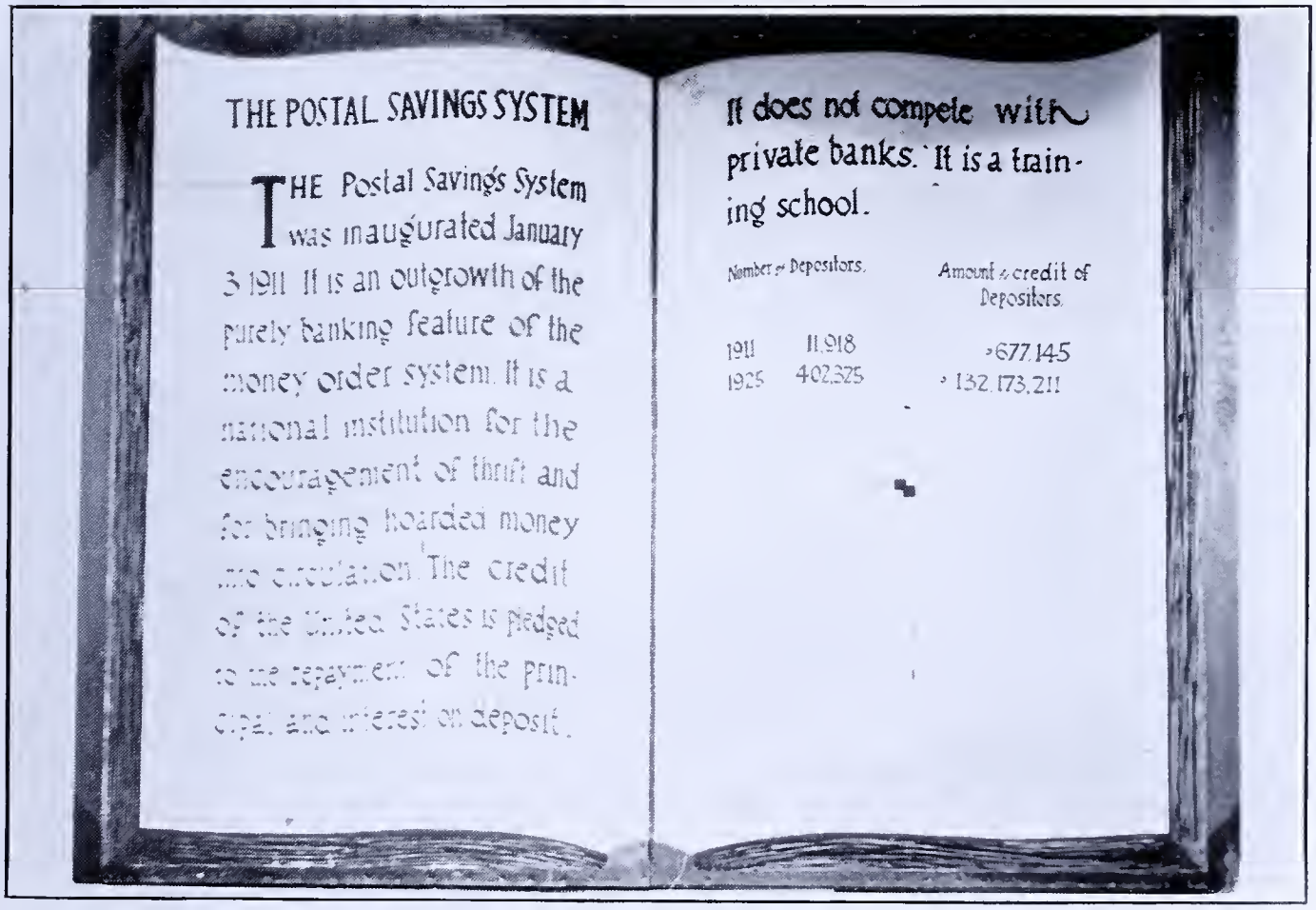

PLATE 104.—"Postal Savings System."

"Exchange of Mail on Detroit River."—Lake steamer exchanging mail with U. S. Tug "Florence B."

"Alaskan Mail Carrier."—Alaskan scene showing mail sledge drawn by eight dogs, small post office building and store building.

"Alaskan Winter Scene."—Shows two sledges and attendants on a frozen stream in Alaska.

"Steamships Detroit and Milwaukee."—First steam vessels to carry mail on the Great Lakes.

"First Steam Car to Carry U. S. Mail."—Shows first car to carry U. S. Mail, "E. & K. R. R." engine (Adrian No. 1) and fuel tender to which is attached house-like car.

"Western Mail Coach."—Shows western mail coach drawn by six horses with passengers.

"Western Mounted Mail Carrier."—Shows a mounted mail carrier of the days of the Pony Express crossing western prairie at speed.

"Star Route Mail Carrier."—Mountain scene showing foot mail carrier of the early days of the country.

"Rural Free Delivery Service."—Shows scene of two farm houses, two-horse wagonette coach, group of persons, rural letter box, etc.

"Porto Rican Mail Carrier."—Scene at U. S. Post Office of small fourth class type. Mounted carrier on horseback.

"Star Route Service—Early Days."—Scene in rural district, small post office, general store, two-horse passenger vehicle of the spring-board type with driver, passengers, mail, etc.

"1800—*Mail Carriers of* 100 *Years Ago*—1800."—This picture shows two scenes, one being that of a cabin in a mountainous rural district with carrier on horseback. The other being that of a part of a train showing two mail cars and a "catcher" device with pouch ready for catching by Railway Postal Clerk.

"Open Books"

Nineteen "Open Books" were displayed as follows:

"Statement by Hon. Harry S. New, Dated June 1, 1926." (Plate 78).

"Money Order System—1876-1926"—Picture of "Father of the Money Order System" and certain blanks and forms used in 1876 and in use in 1926. (Plate 102).

"Sample Postal Savings Certificates."

"Story of the Money Order." (Plate 103).

"Postal Savings System." (Plate 104).

"Tribute to the Postal Service"—Legend on front of New York Post Office. (Plate 105).

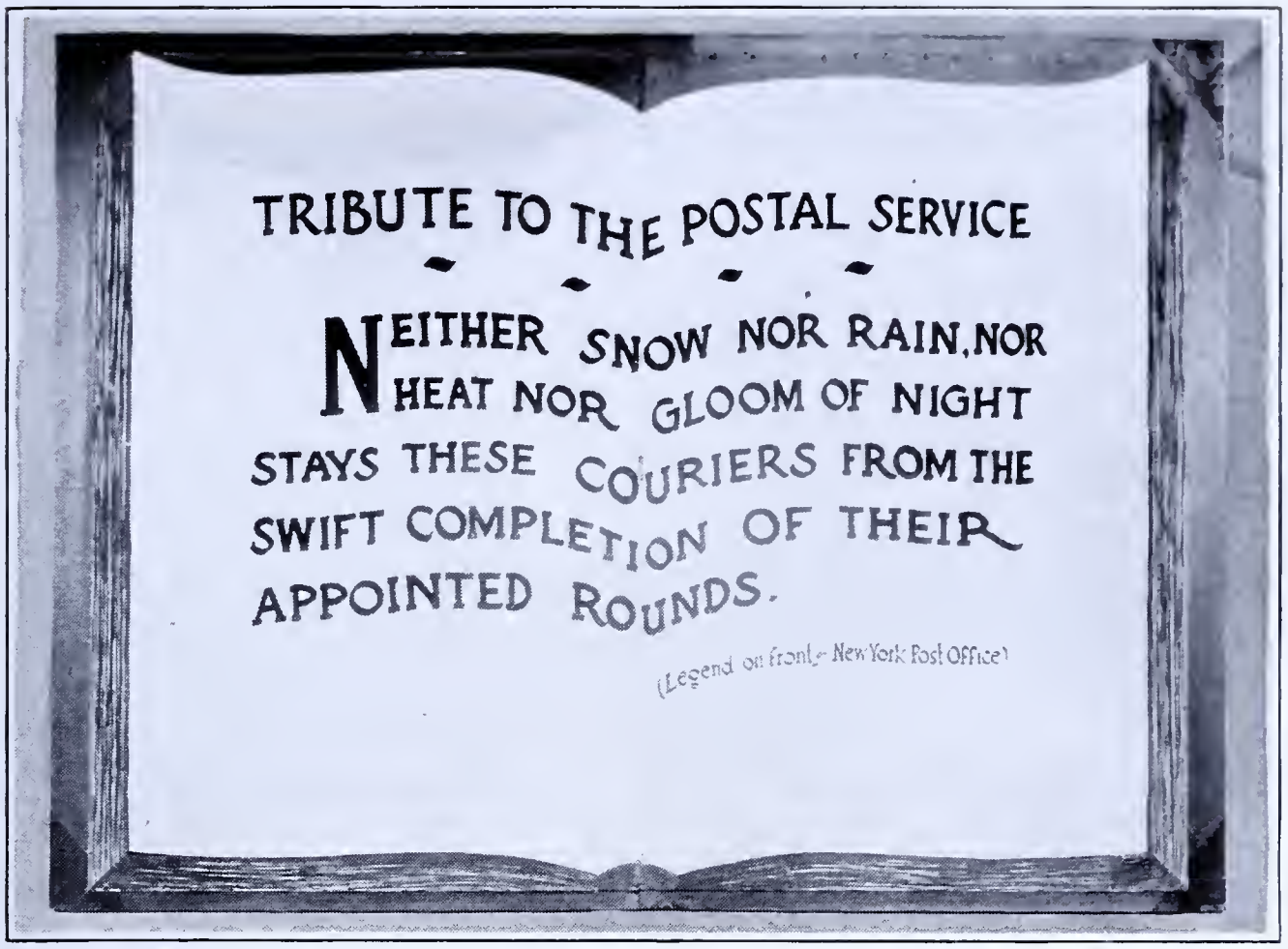

PLATE 105.—"Tribute to the Postal Service."

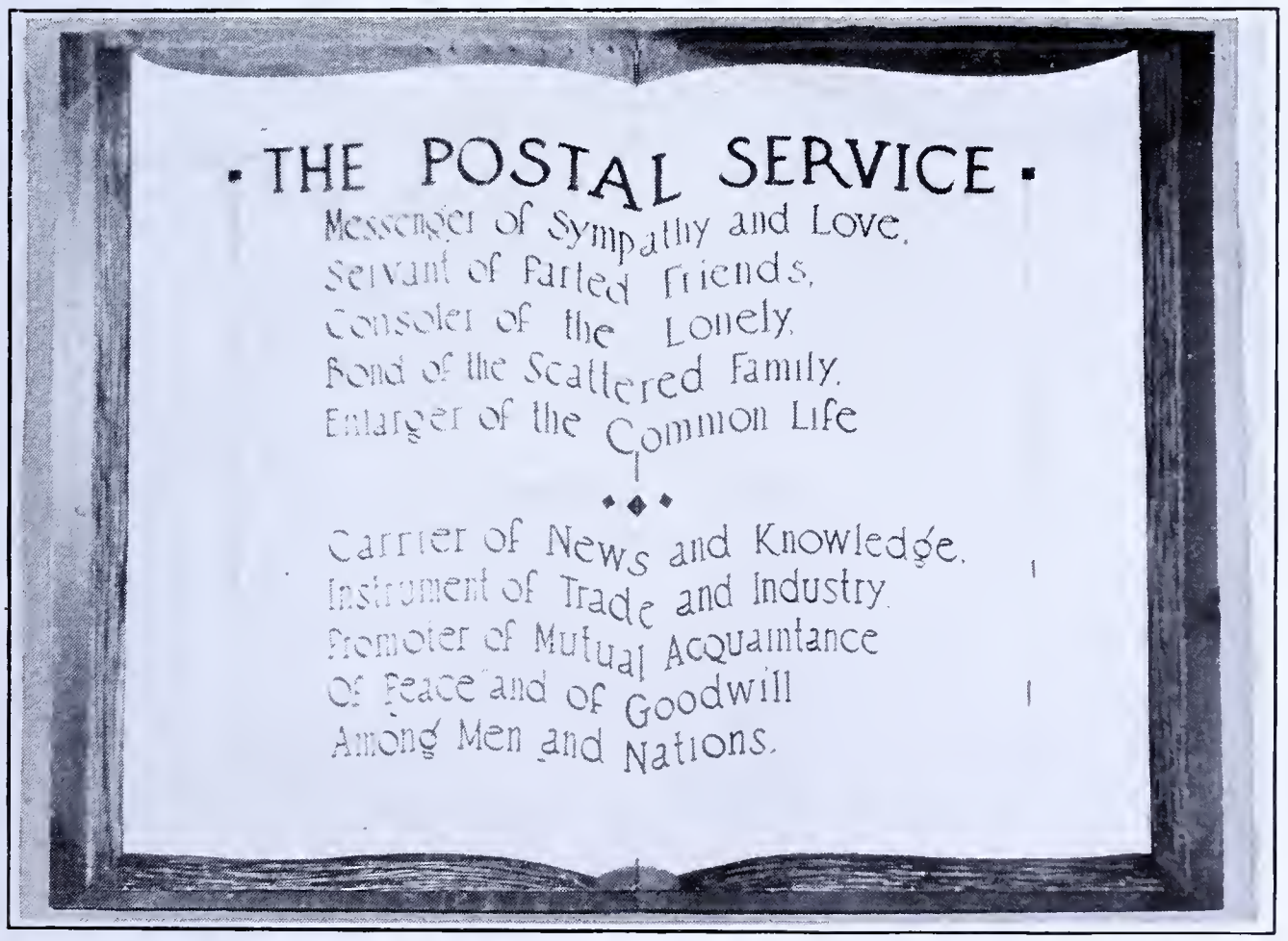

PLATE 106.—"The Postal Service."

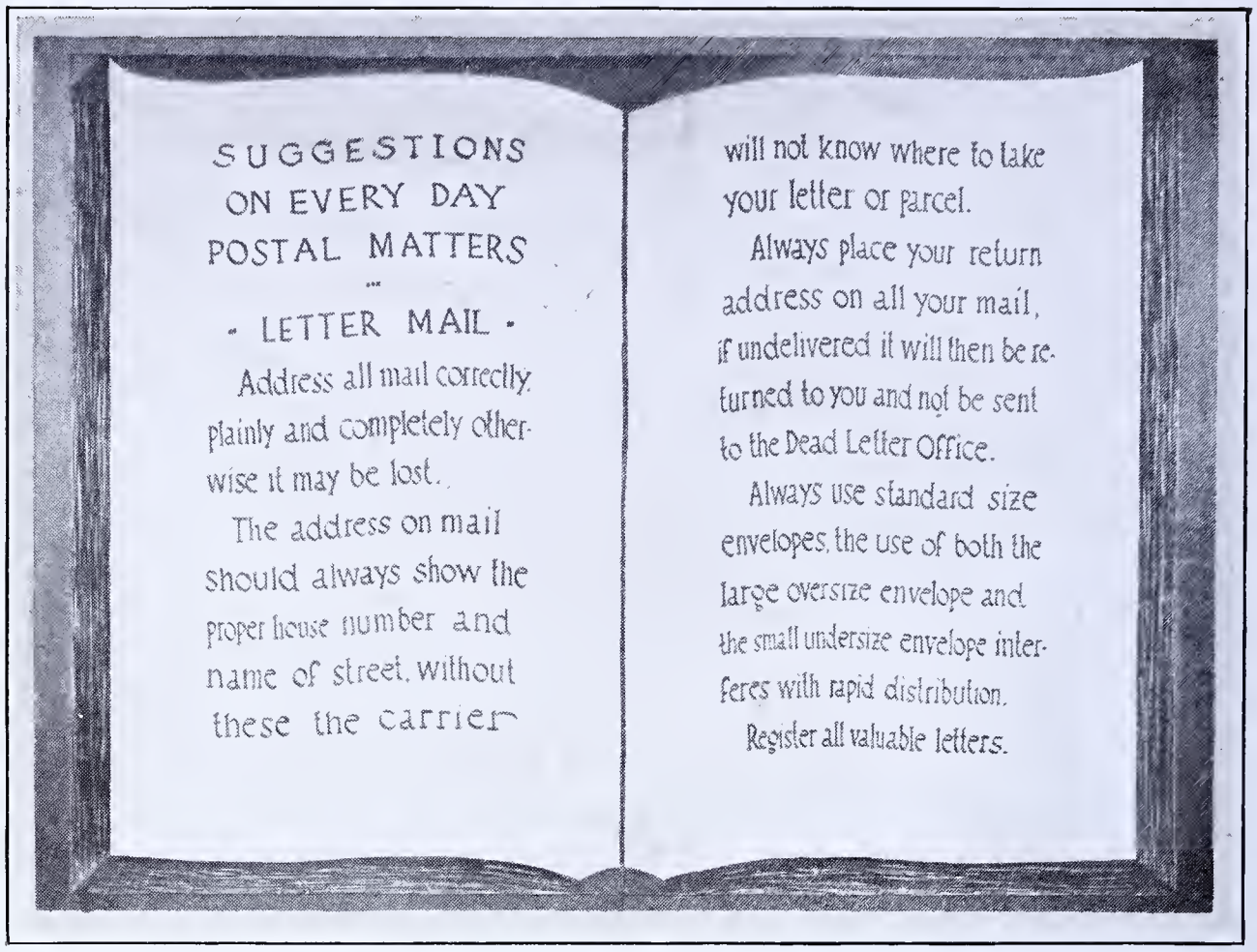

PLATE 107.—"Suggestions on Everyday Postal Matters, Letter Mail."

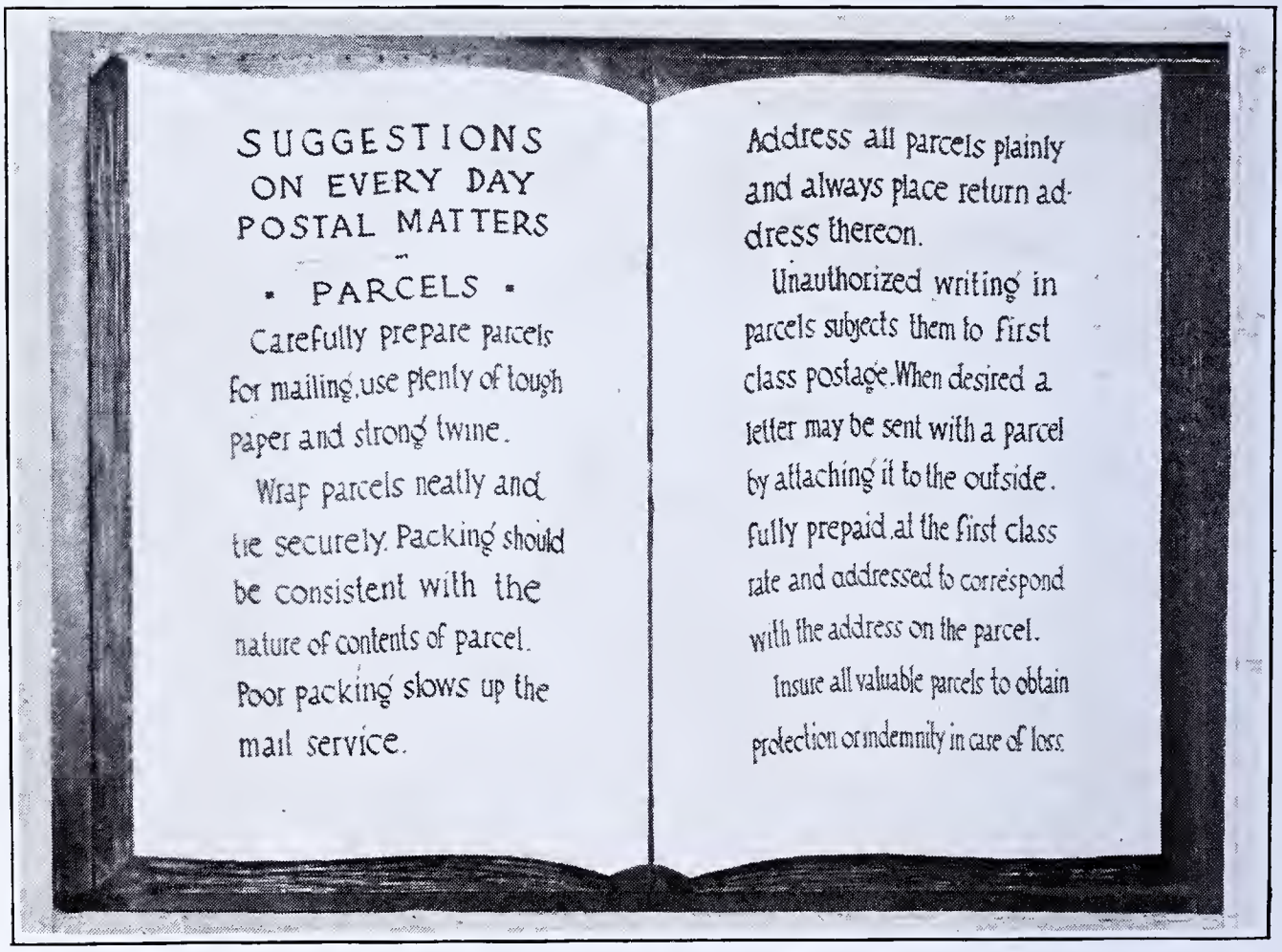

PLATE 108.—"Suggestions on Everyday Postal Matters, Parcels."

"Statement of Hon. Calvin Coolidge, President of the United States, the White House, September 5, 1923." (Plate 77).

"Postal Service"—Legends on Front of the Post Office at Washington, D. C. (Plate 106).

"Suggestions on Everyday Postal Matters—Letter Mail." (Plate 107).

"Suggestions on Everyday Postal Matters—Parcels." (Plate 108). "Carefully prepare parcels for mailing, use plenty of tough paper and strong twine. Wrap parcels neatly and tie securely. Packing should be consistent with the nature of contents of parcel. Poor packing slows up the mail service. Address all parcels plainly and always place return address thereon. Unauthorized writing in parcels subjects them to first class postage. When desired, a letter may be sent with a parcel by attaching it to the outside, fully prepaid at the first class rate and addressed to correspond with the address on the parcel. Insure all valuable parcels to obtain protection or indemnity in case of loss."

"Model Form" for Correctly Addressing Letters or Parcels

After 5 days return to
John C. Smith
Rural Route No. 1, Box 74
Wilkesville, N. Y.

Stamp.

Mr. Henry Brown
24789 Alaska Ave.
Chicago,
Illinois.

The following four points should be followed in addressing all mail matter:

1. Always give street and number, post office box, or rural route and box number. 2. Write the name of State in full. 3. Place return address in upper left corner of address side. 4. Affix stamp in upper right corner.

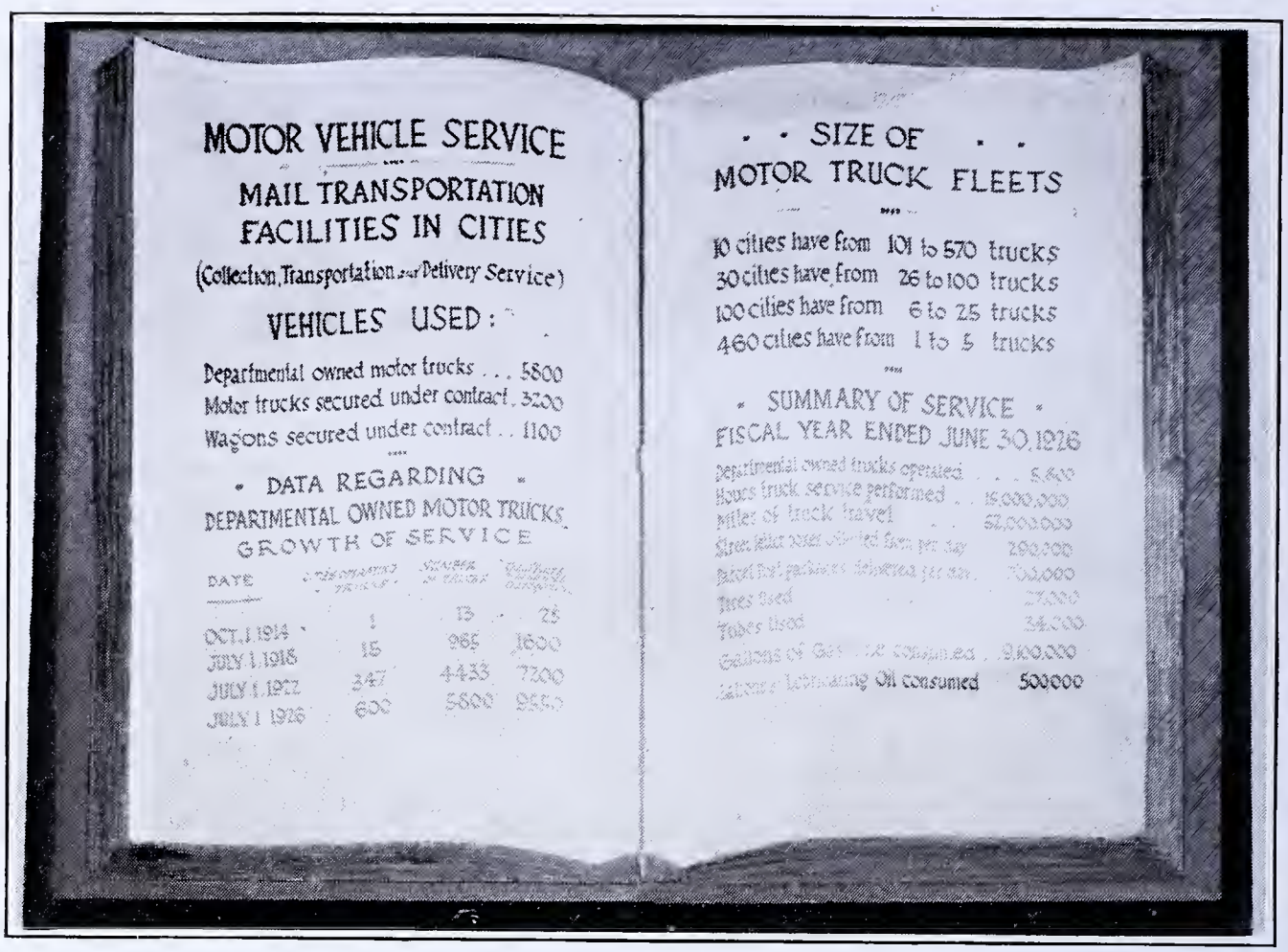

PLATE 109.—Motor Vehicle Service.

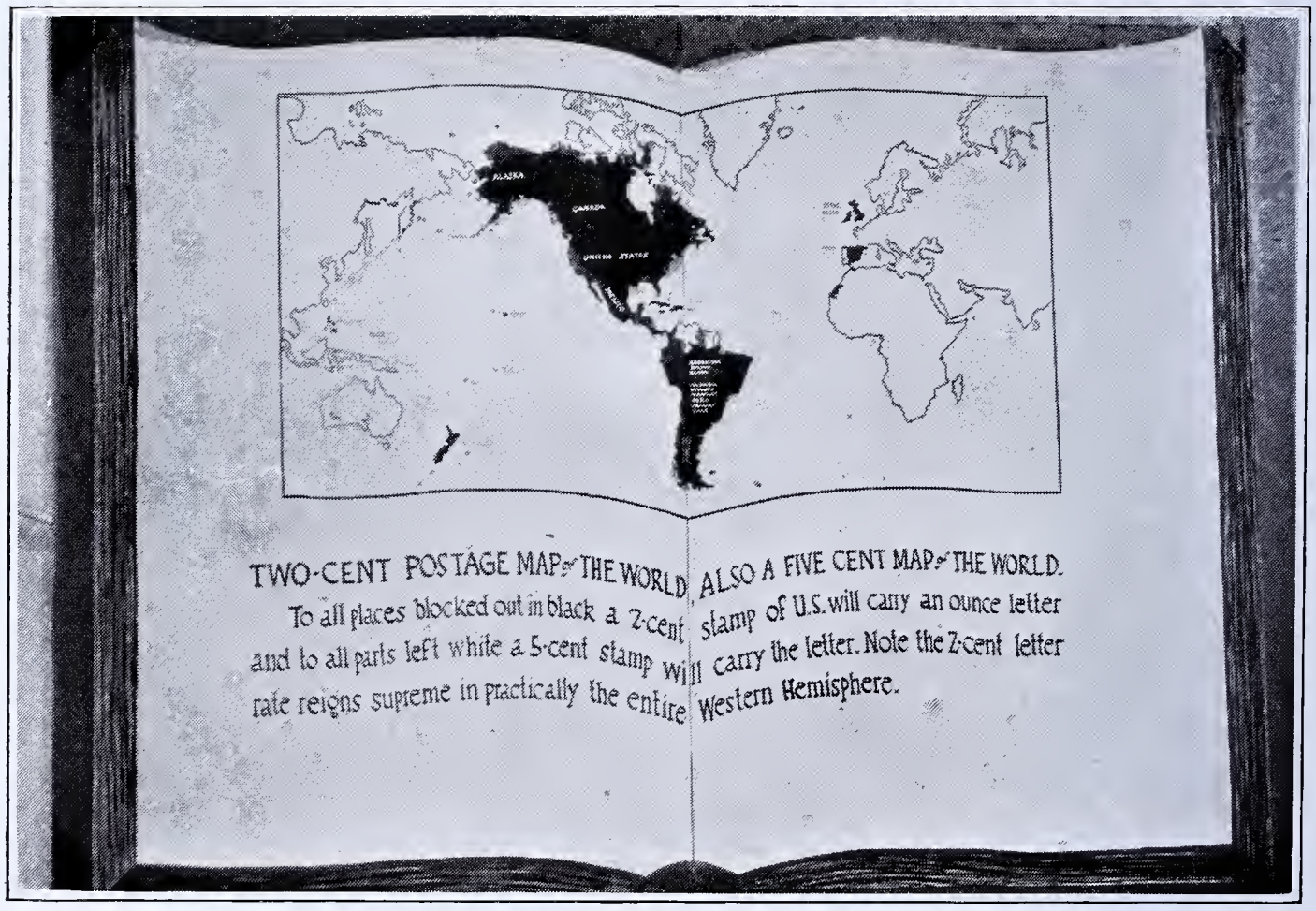

PLATE 110.—"Two Cent and Five Cent Postage Map of the World."

"Motor Vehicle Service."—Mail transportation facilities in cities, collection, transportation and delivery service. (Plate 109).

Vehicles Used

Department owned motor trucks	5800
Motor trucks secured under contract	3200
Wagons secured under contract	1100

Data Regarding Departmental Owned Motor Trucks

Growth of Service

Date	Cities operating trucks	Number of trucks	Garagemen Chauffeurs Mechanics
Oct. 1, 1914	1	13	25
July 1, 1918	15	965	1600
July 1, 1922	347	4433	7200
July 1, 1926	600	5800	9550

Size of Motor Truck Fleets

10 cities have from 101 to 570 trucks
30 cities have from 26 to 100 trucks
100 cities have from 6 to 25 trucks
460 cities have from 1 to 5 trucks

Summary of Service Fiscal Year Ended June 30, 1926

Departmental owned trucks operated	5,800
Hours truck service performed	15,000,000
Miles of truck travel	52,000,000
Street letter boxes collected from per day	290,000
Parcel post packages delivered per day	700,000
Tires used	27,000
Tubes used	34,000
Gallons of gasoline consumed	9,100,000
Gallons of lubricating oil consumed	500,000

"Suggestions on Every Day Postal Matters."—Do not hide your money. Put it in a Postal Savings account. Register all valuable letters. Never enclose money in a letter unless it is registered. Use United States postal money orders to transmit money. Insure all valuable parcels. Use special handling service for quick transportation of parcels; especially advantageous for perishables. Use the special air mail letter boxes where convenient, as they speed your letters on their way. Always mail your letters and other mail early in the day. This will insure prompt dispatch and delivery. Consult your postmaster on all postal problems. He can give you valuable information.

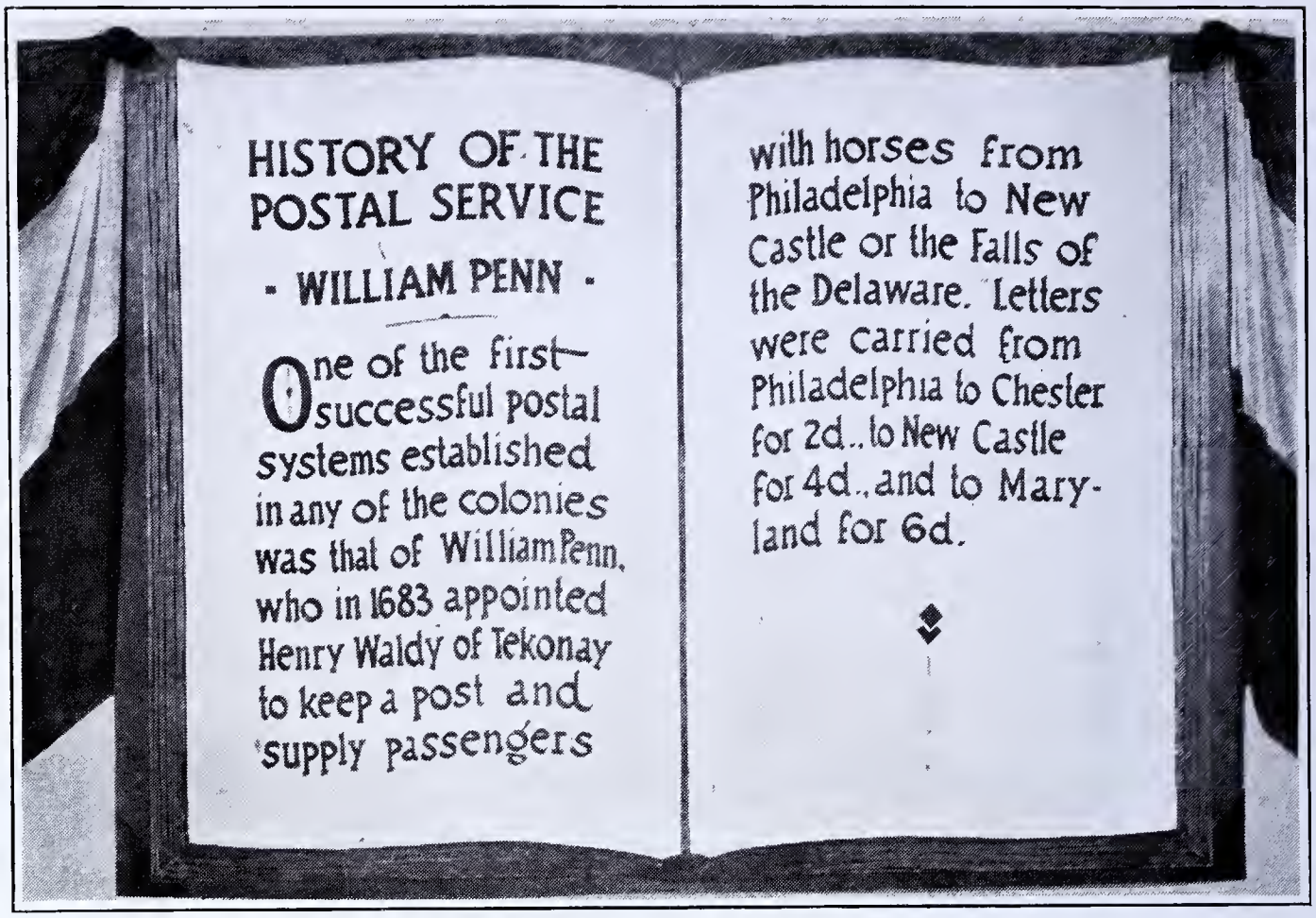

PLATE 111.—"History of the Postal Service, William Penn."

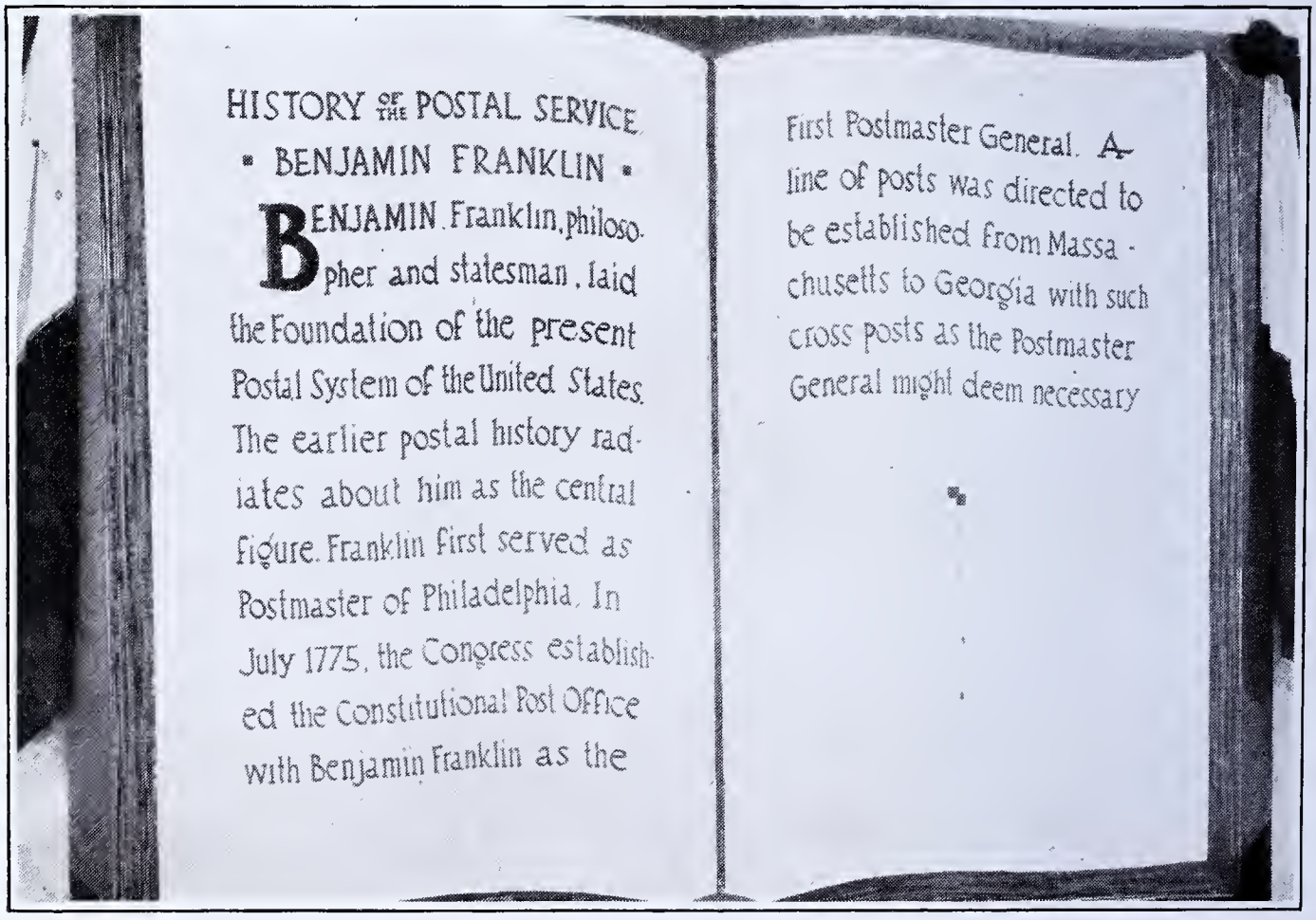

PLATE 112.—"History of the Postal Service, Benjamin Franklin."

"Two-cent Postage Map of the World, also a Five-cent Map of the World."—(Plate 110). To all places blocked out in black a 2 cent stamp of the United States will carry an ounce letter and to all parts left white a 5-cent stamp will carry the letter. Note the 2-cent letter rate reigns supreme in practically the entire Western Hemisphere.

"History of the Postal Service—Official Beginning in the Colonies."—"The General Court of Massachusetts in 1639 ordered that Richard Fairbanks, his house in Boston, is the place appointed for all letters, which are brought from beyond the seas, or are to be sent thither; (they) are to be brought unto him and he is to take care that they be delivered, or sent according to their directions and he is allowed for every such letter one penny and must answer all miscarriages through his own neglect in this kind; provided that no man shall be compelled to bring his letters thither except he please."

"History of the Postal Service—First Step Toward a Domestic Post."—"The first step toward a domestic post for connecting the several Colonies was taken in 1672, when Governor Lovelace of New York, decreed that a post should go monthly between New York and Boston." "This was the first post route officially established in America. The necessary arrangements were made with a person whom the Governor conceived most proper, being voted active, stout and indefatigable." "I have," says Governor Lovelace, "affix an annuall sallary on him, which, together with the advantage of his letters and other small postable packes, may afford him a handsome livelyhood." The pioneer postman had to travel through the trackless forest and it was a part of his duty to mark the trees for travelers who might wish to follow him.

"History of the Postal Service—William Penn."—(Plate 111). One of the first successful postal systems established in any of the colonies was that of William Penn, who in 1683 appointed Henry Waldy Tekoney to keep a post and "supply passengers with horses from Philadelphia to New Castle or the Falls of the Delaware." Letters were carried from Philadelphia to Chester for 2d., to New Castle for 4d., and to Maryland for 6d.

"History of the Postal Service—Benjamin Franklin." (Plate 112). Benjamin Franklin philosopher and statesman, laid the foundation of the present Postal System of the United States. The earlier postal history radiates about him as the central figure. Franklin first served as Postmaster of Philadelphia. In July, 1775, the Congress established the Constitutional Post Office with Benjamin Franklin as the First Postmaster General. A line of posts was directed to be established from

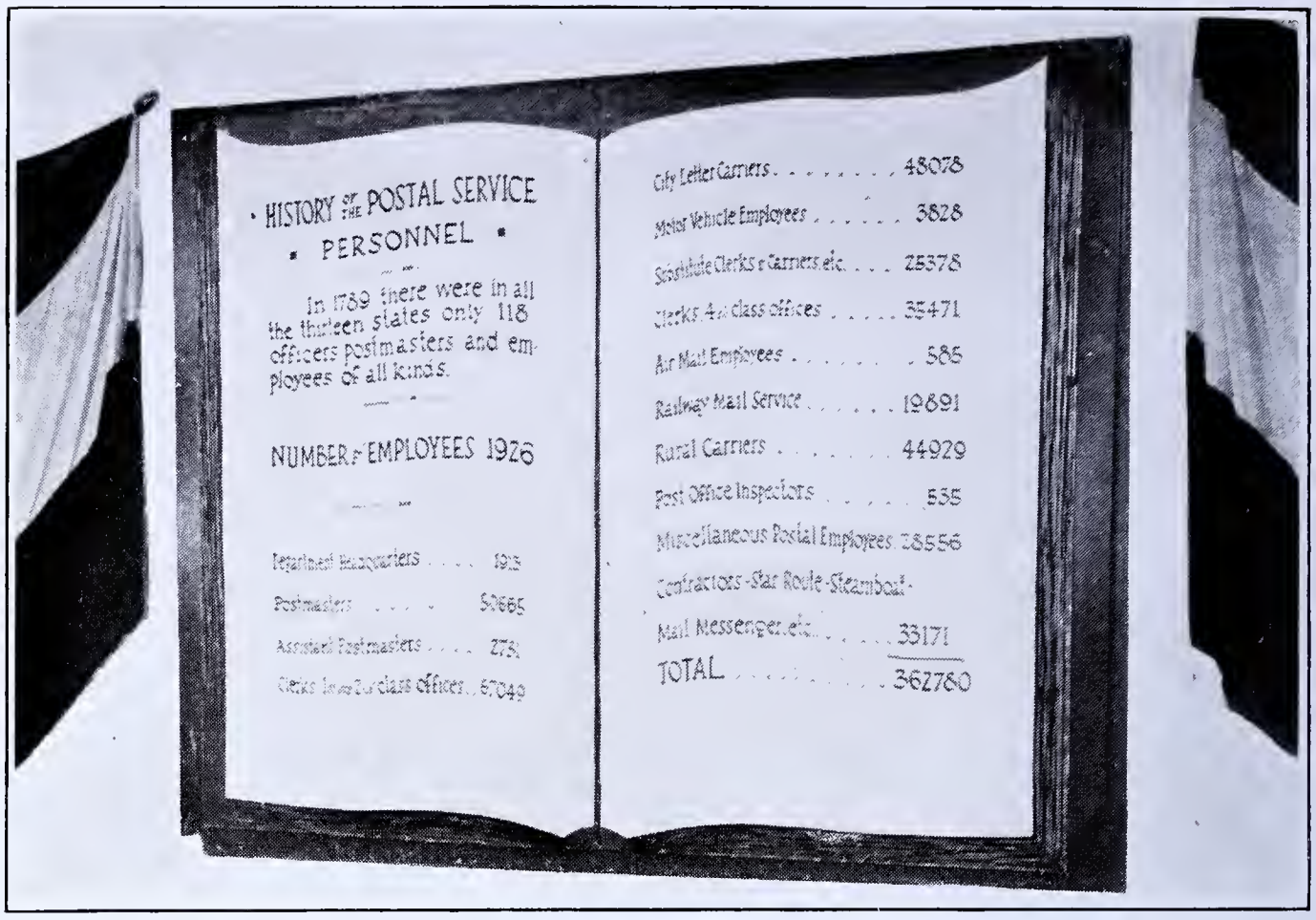

PLATE 113.—"History of the Postal Service, Personnel."

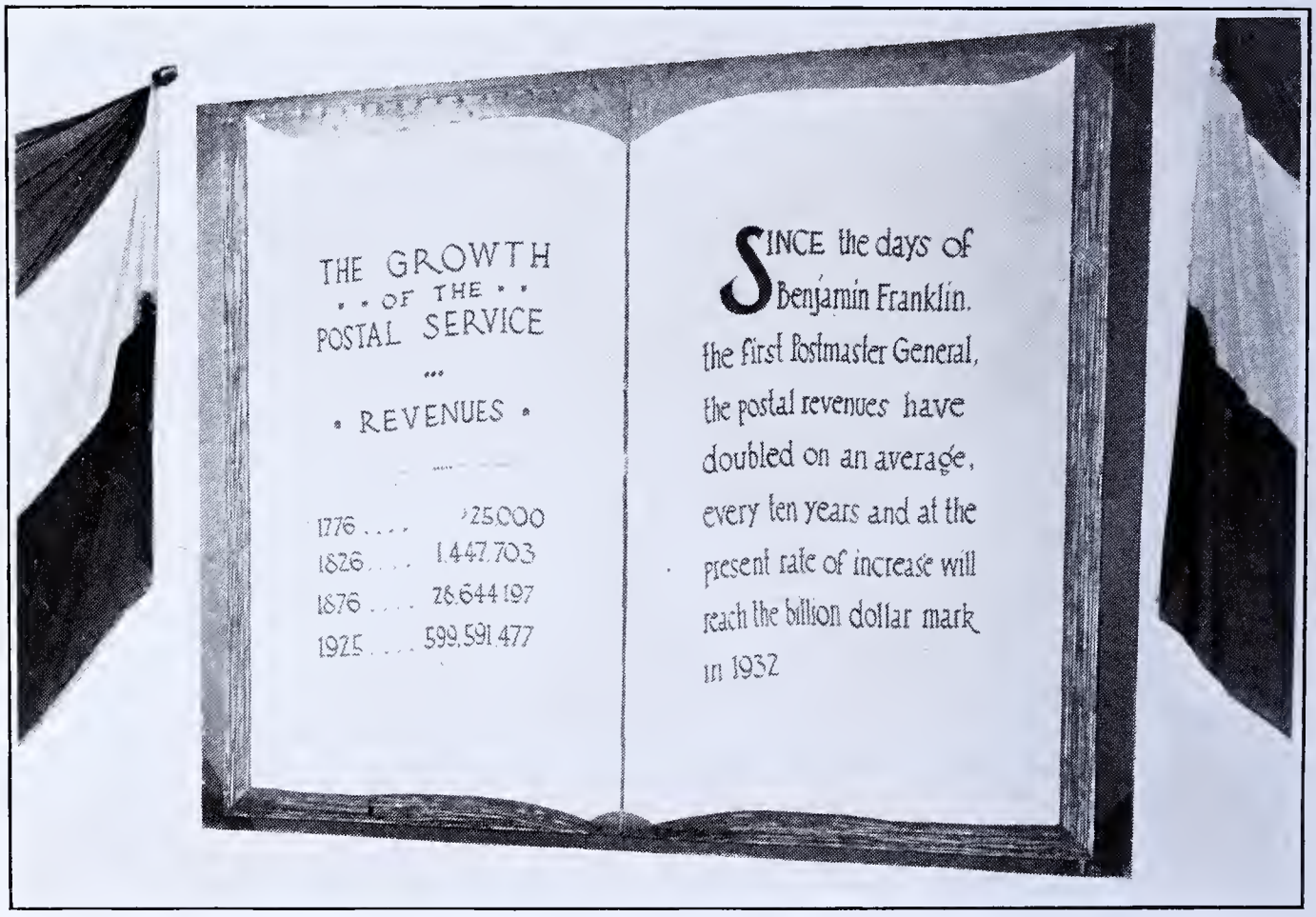

PLATE 114.—"Growth of the Postal Service."

PLATE 115.—General view of the Railway Mail Service Exhibit.

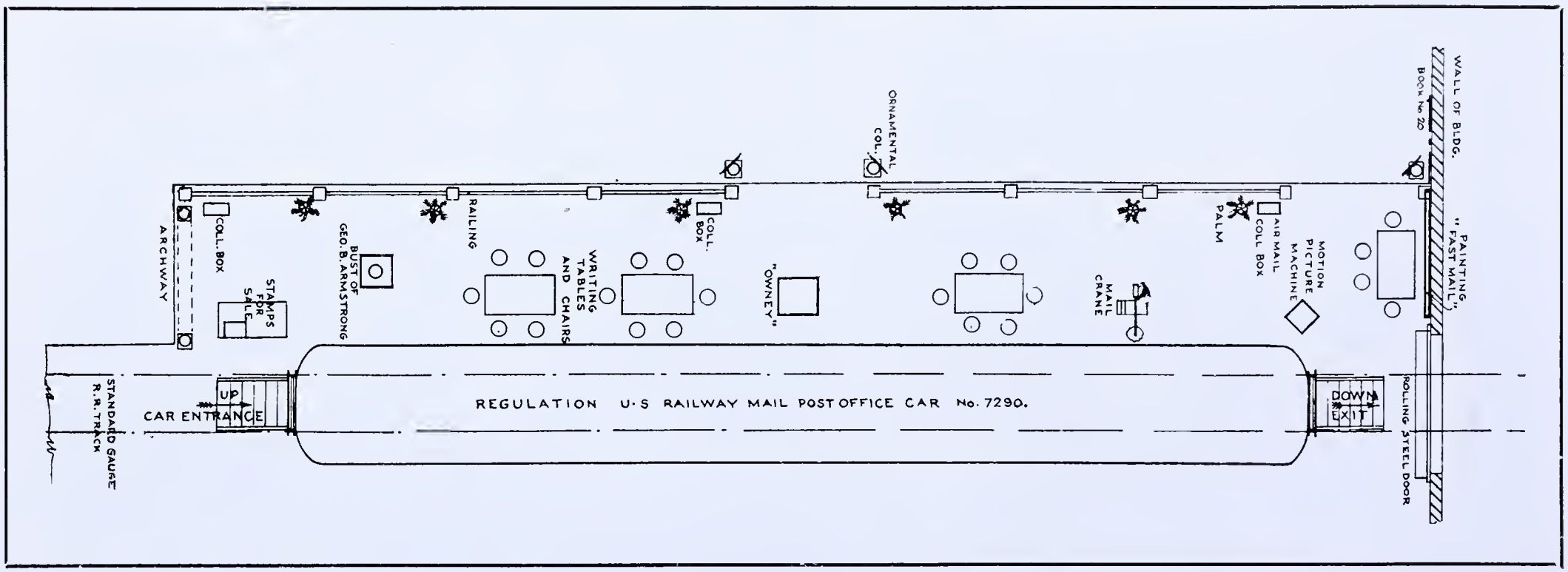

PLATE 116.—This was a fully equipped steel railway post office car, having all the distributing facilities—letter cases, racks and overhead boxes—and storage accommodations and other necessary up-to-date equipment. This car was open for the inspection of visitors. Alongside the railway mail car was shown the mail crane or "catcher" device used in connection with the dispatch of mail to non-stop railway post offices. With this exhibit of the railway mail car was a bust of George B. Armstrong, "Father of the Railway Mail Service;" a painting of "Fast Mail Train" by Frank A. Dony, Post Office Department; and the mounted specimen of "Owney"—the dog who was at one time the railway postal mascot, and who traveled 143,010 miles and received 1017 medals.

PLATE 117.—Side view of Postal Railway Car, showing crane for catching mail on non-stop trains. "Owney" in case in foreground.

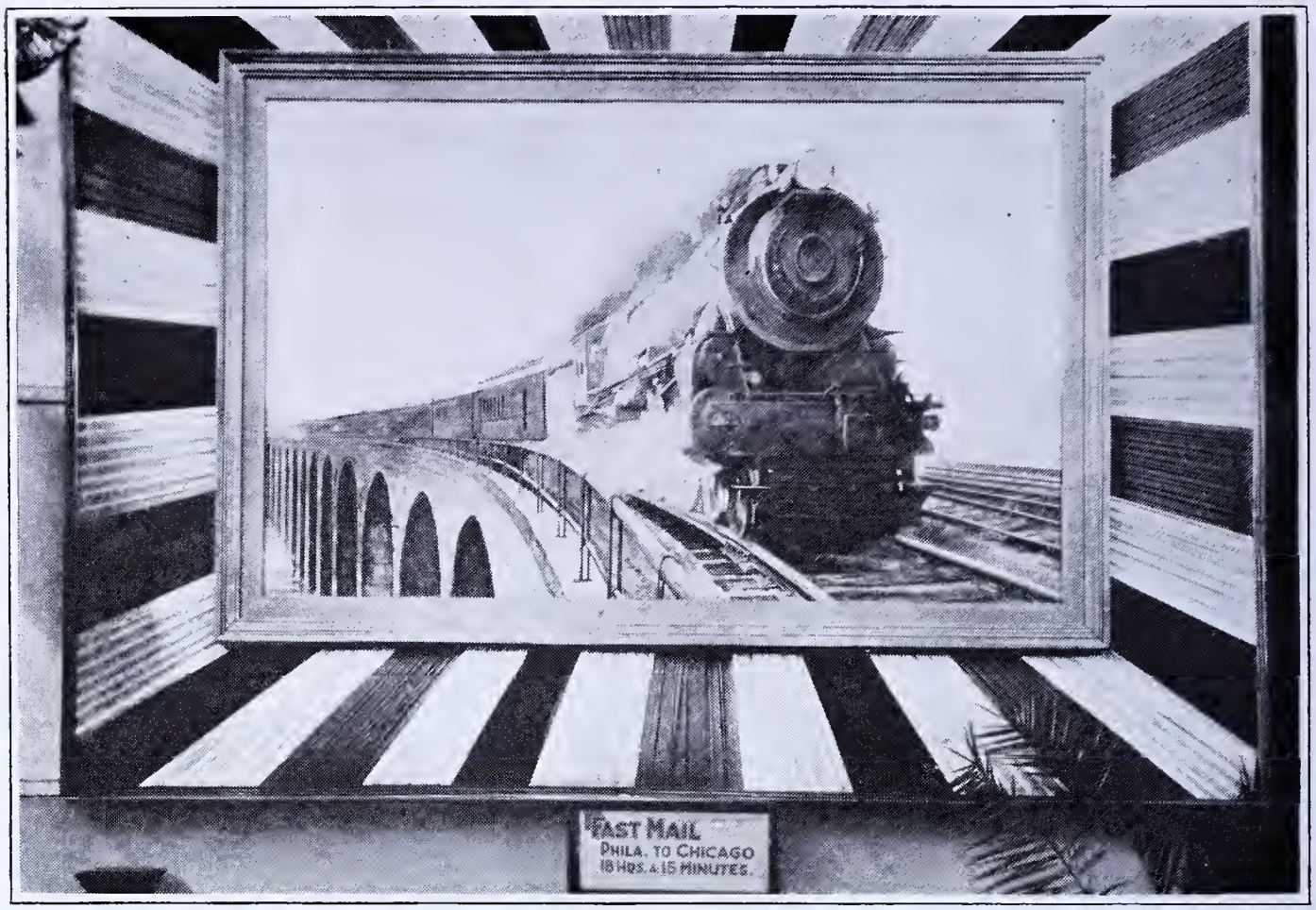

PLATE 118.—Painting of the "Fast Mail."

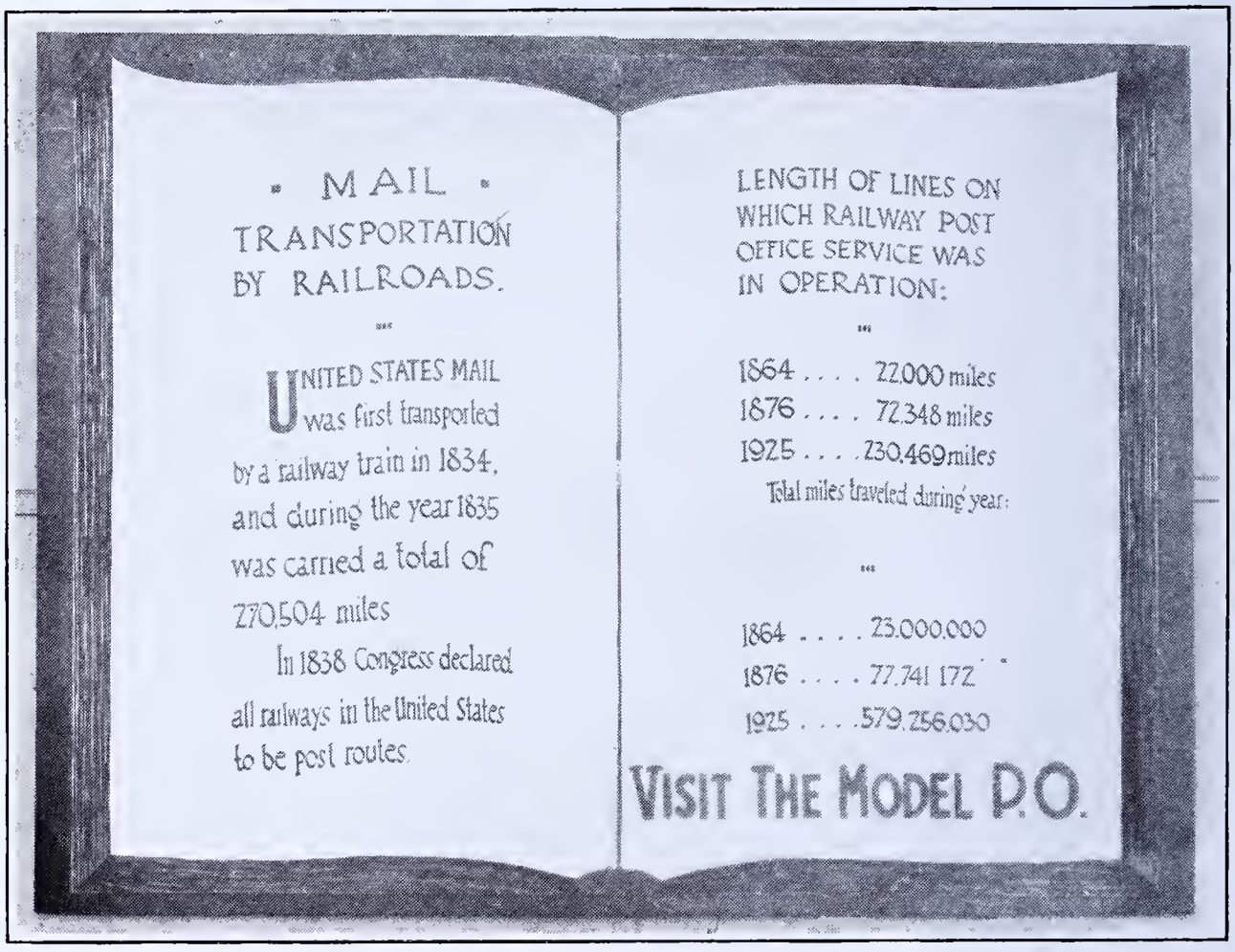

PLATE 119.—"Mail Transportation by Railroads."

Massachusetts to Georgia with such cross posts as the Postmaster General might deem necessary.

"History of the Postal Service—Personnel." (Plate 113).—In 1789 there were in all the thirteen states only 118 officers, postmasters and employees of all kinds. Number of Employees, 1926: Department Headquarters—1913; Postmasters, 50,665; Assistant Postmasters, 2,731; Clerks, 1st and 2nd Class Officers, 67,049; City Letter Carriers, 48,078; Motor Vehicle Employees, 3,828; Substitute Clerks and Carriers, etc., 25,378; Clerks, 4th class offices, 35,471; Air Mail Employees, 585; Railway Mail Service, 19,891; Rural Carriers, 44,929; Post Office Inspectors, 535; Miscellaneous Postal Employees, 28,556; Contractors, Star-Route-Steamboat-Mail Messengers, etc., 33,171; Total, 362,780.

"Growth of the Postal Service." (Plate 114).—The Postal Revenues in 1776 were $25,000; in 1826 they were $1,447,703; in 1876 they were $28,644,197; and in 1925 they were $599,591,477. Since the days of Benjamin Franklin, the first Postmaster General, the postal revenues have doubled on an average, every ten years and at the present rate of increase will reach the billion dollar mark in 1932.

Miniature Model Railway Post Office Car

This model of wooden construction 60 foot full R. P. O. car was built more than a quarter of a century ago.

Railway Mail Service

This exhibit (Plate 115) which was located in Building No. 5, consisted of the U. S. Railway Mail Post Office Car No. 7290 (Plate 116). Bust of the "Father of the Railway Mail Service." Mail crane "catcher device," used in connection with the dispatch of mail to non-stop railway post offices. "Owney," the railway postal mascot who traveled 143,010 miles and received 1,017 medals. (Plate 117). Painting of Fast Mail Train. (Plate 118).

"Open Book" entitled "Mail Transportation by Railroads." (Plate 119).

THE DEPARTMENT OF THE NAVY

THE DEPARTMENT OF THE NAVY

Foreword

Broadly speaking, the entire Navy Yard at Philadelphia, with the ships at the docks, and its historical exhibits, was the Navy's contribution to the Government's exhibits at the Sesquicentennial. Never before at an exposition had there been such an excellent opportunity for comparing accomplishments of the past century with those of the present. Advantage was taken of this opportunity, and there was assembled at the Sesquicentennial a naval exhibit of the greatest historic significance.

Outside the Navy Yard, but within the grounds of the exposition, was a model Marine Camp, Camp Samuel Nicholas. Here was a replica of Tun Tavern in which were a number of paintings illustrating stirring events in Marine Corps history, and in Building No. 5 was an air craft display, its chief element and feature exhibit being the NC-4, the first flying boat to cross the Atlantic. The Naval Aircraft factory within the yard was open to visitors, as were other shops, and dry docks, the foundry and the Marine Barracks. Daily drills, band concerts, airplane flights, were events that added life and interest to the Navy's exhibit. Among the outstanding features were the old frigate "Constellation," the "Cheyenne"—the last vessel of the Monitor type. Of more recent construction was the "Olympia," Dewey's famous war vessel, while close by were destroyers and submarines of the present day.

The historical exhibit, installed in Building No. 29, within the Navy Yard, was ready for the inspection of visitors on May 31—the opening day of the Exposition. In this building were a great many exceedingly interesting exhibits which are fully described and pictured in the Navy Department report.

PLATE 39.—Replica of Tun Tavern. Birthplace of U. S. Marine Corps.

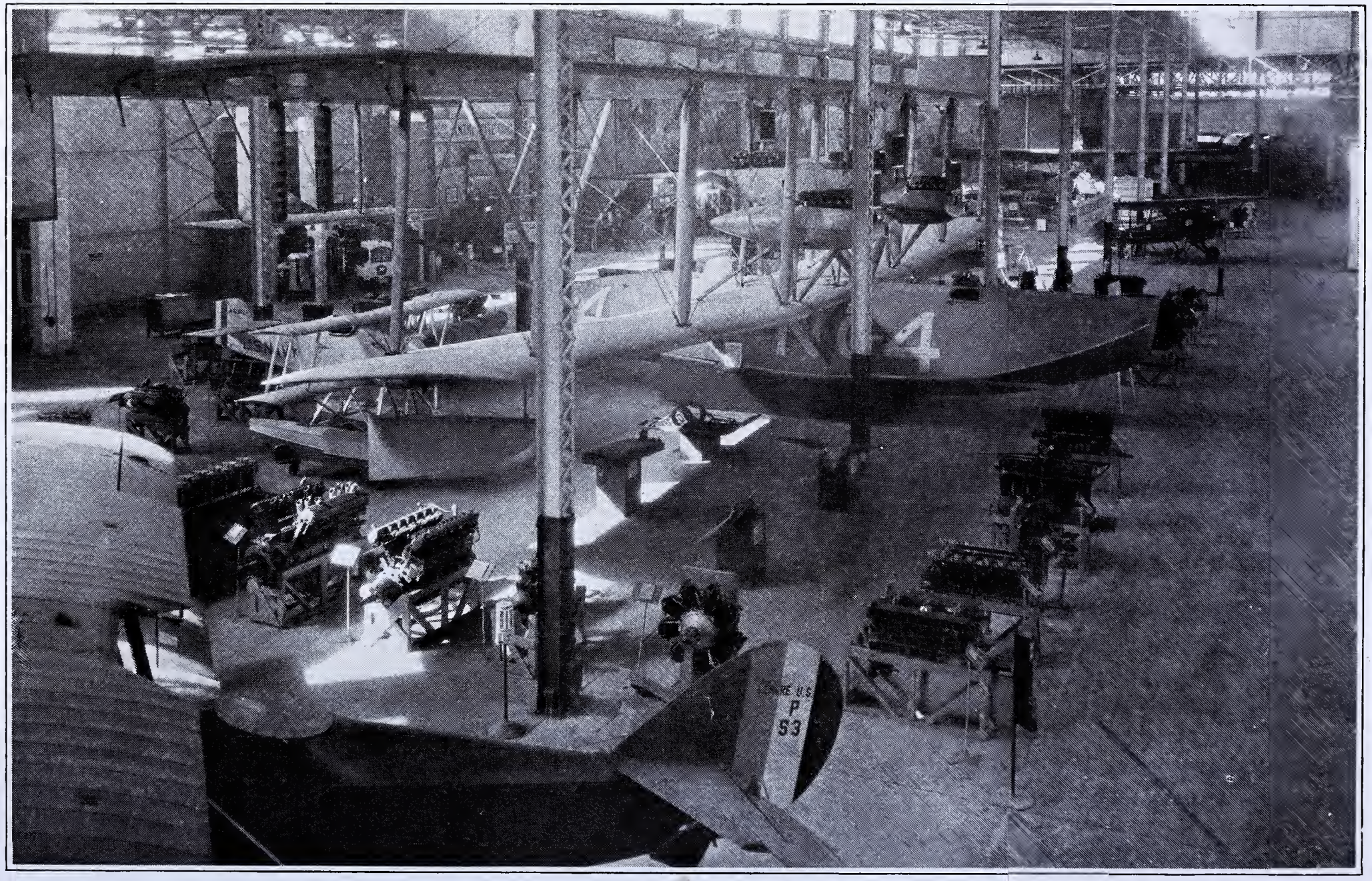

PLATE 40.—Naval Aircraft exhibit in Building No. 5 showing the NC-4, the first flying boat to cross the Atlantic.

PLATE II.—United States Ship CONSTELLATION.

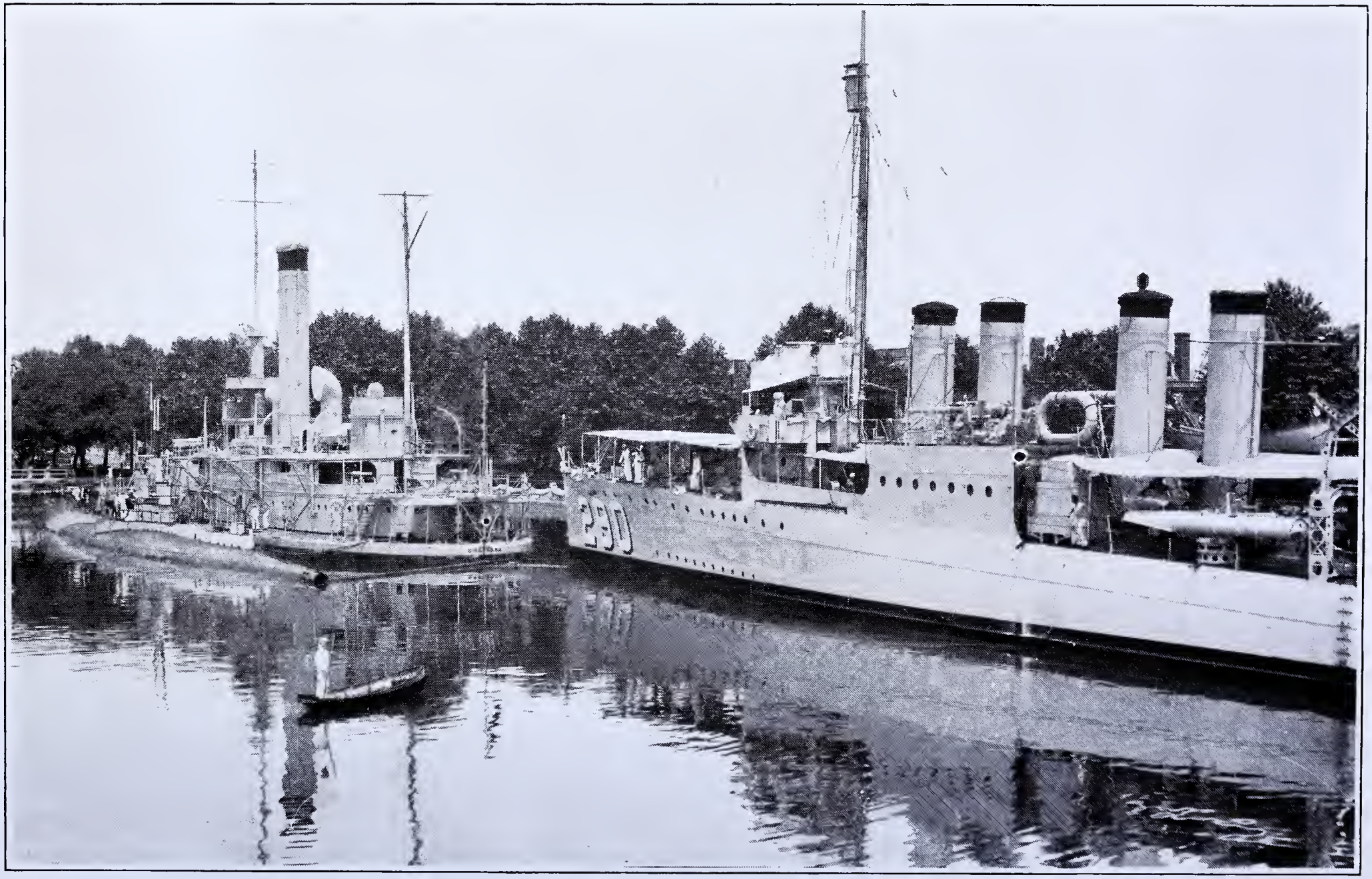

PLATE 42.—U. S. S. "CHEYENNE" and "S-22"—bow of U. S. S. "DALE."

Exhibits of
The Department of the Navy
at the
Sesquicentennial Exposition
1926

Introduction

The Exhibit of the Navy Department was, for the most part, within the Navy Yard, Philadelphia, and included the Navy Yard itself, the ships within it, and an historical exhibit in one of its buildings. Those exhibits that were within the Exposition Grounds proper were a model marine camp with its replica of Tun Tavern (Plate 39) which housed a number of paintings depicting stirring incidents of Marine Corps history, and an aircraft exhibit in Building No. 5. This latter had as its center of interest the NC-4 the first airplane to fly across the Atlantic. (Plate 40).

Description of the Exhibits

The Navy Yard, Philadelphia, is immediately adjacent to the Exposition Grounds and was a large exhibit showing the intimate relation between the seagoing Navy and the shore facilities necessary to maintain it. Among the activities of the Yard open to visitors were the naval aircraft factory, shops of various kinds, dry docks, cranes, the foundry, and Marine Barracks. Daily drills by blue jackets and marines, band concerts by a Navy band, airplane flights from land and water, and catapult shots of airplanes were among the events that added interest to a visit to the Navy Yard.

Ships

Moored at the sea wall of the Reserve Basin near the entrance to the Navy Yard were ships illustrating the change in type of men-of-war since the Revolution. The old frigate *Constellation* (Plate 41) with her spars towering far above her staunch wooden hull carried the visitor back to the early days of our national history; the *Cheyenne*, (Plate 42), the only remaining vessel of the monitor type on the Navy list was a monument to Ericcson and to the momentous change in naval vessels that came with the introduction of armor; Dewey's famous *Olympia*, (Plate 43) a veteran of the World War, as well as of the War with Spain in 1898, showed the further development of the armored vessel. Close by these were the Destroyer and

PLATE 43.—U. S. S. "OLYMPIA" Dewey's Flagship at Manila.

PLATE 11.—Front entrance of Building No. 29.

PLATE 45.—View of Naval Historical Exhibit.

Submarine in commission with the fleet of the present day; the submarine illustrating the type of ship used for subsurface warfare and the destroyer, with its dual mission of protecting its own capital ships from submarines and attacking with torpedoes capital ships of an enemy.

At the Navy Yard, but moored to piers along the Delaware River water front, were vessels of other types undergoing repairs or alterations. These were vessels of the Fleet and their presence was incidental to their normal employment. The Naval Academy Practice Squadron, consisting of the U. S. S. *Wyoming*, *Utah* and *New York* were at Philadelphia for ten days, the U. S. S. *Arkansas* was being modernized, scout cruisers, destroyers, tenders, and survey ships were other American men-of-war at the Navy Yard during parts of the six months that the Exposition was open.

Historical and Modern Material

The building known as No. 29, which housed the Navy Historical Exhibit, had been a storehouse in the Navy Yard. (Plate 44). The stores were removed and the interior of the building was renovated and remodelled to make it suitable for installation of the exhibit. This work was completed on May 24th. The exhibit was installed by May 31st and was ready for visitors on the opening of the Sesquicentennial International Exposition on that date. (Plate 45).

The exhibit was divided into historical and modern sections, with the main entrance opening into the historical section. In this section the floor space was divided into blocks so arranged as to enable the visitors to see the exhibits in their historical sequence. These blocks were the Revolutionary War, the War of 1812, the Civil War and the Spanish War periods. In addition a space was allotted for the model of the Philadelphia Navy Yard, to scale, and a special case, made to fit into one of the corners of the building, contained the models, to scale, of all the famous ships from the *Bon Homme Richard* to the new airplane carrier *Lexington*. A mezzanine gallery in this section contained a large collection of models of our ships of the modern Navy.

The modern section of the exhibit was located on two floors. The ground floor contained the Ordnance, Naval Observatory, Aeronautical, Engineering and Naval Academy blocks. On the mezzanine floor were the U. S. Marine Corps exhibit, the medical and the hydrographic exhibits.

THE DEPARTMENT OF THE NAVY

Sources and Assembly of Exhibit

Over half of the historical exhibit was brought from the museum of the Naval Academy at Annapolis, Md.; from the Navy Department at Washington, D. C., were chosen ship models, the model of the Lakehurst hangar housing the *Los Angeles*, and most of the paintings; models of the Navy's 14-inch railway mount, the Supply Depot, Brooklyn, N. Y.; and the cross section of a battleship showing activities of the supply department were withdrawn temporarily from the National Museum. The modern ordnance exhibit was obtained from the Naval Ammunition Depot, Fort Mifflin, and from the Navy Yard, Philadelphia, Pa., while the aeronautical exhibit was made up by the Naval Aircraft Factory at the Philadelphia Yard. The Medical Exhibit was constructed by members of the Naval Hospital at Philadelphia. The Naval Observatory supplied the time service and navigational instruments, while the Hydrographic Office furnished the display of charts.

Relics of the U. S. S. *Hartford* were obtained from the Navy Yard, Charleston, S. C. The figurehead of the U. S. S. *Kearsarge*, together with the first log book of the U. S. Navy Yard, Mare Island, Calif., (in Admiral Farragut's handwriting) were obtained from that navy yard. The uniforms of Officers and enlisted men of the Revolutionary, Civil War, Spanish War and present periods were manufactured under the direction of the Officers' Uniform Shop at Brooklyn, N. Y.

The complete collection of Naval flags, from the early colonial period to the present day, was obtained from the Naval Supply Depot, Brooklyn, N. Y.

The two paintings, "The Arrival of the U. S. Fleet at Scapa Flow" and "The Surrender of the German High Seas Fleet" by Gribble, were from the committee room of the House Committee on Naval Affairs where these paintings ordinarily hang.

The transparencies, placed in all the windows, were prepared at the Naval Air Station, Anacostia, D. C.

Historical Exhibit

The main entrance to the building was at the Broad Street door which was flanked by two 7″ tractors and by two smooth bore guns. Just inside the entrance the visitor found on the right a booth where information regarding the Navy, Navy Yard, Philadelphia, and the Naval Exhibit could be obtained. On the left of the entrance was a relief map of the Navy Yard, Philadelphia, showing the location to scale of

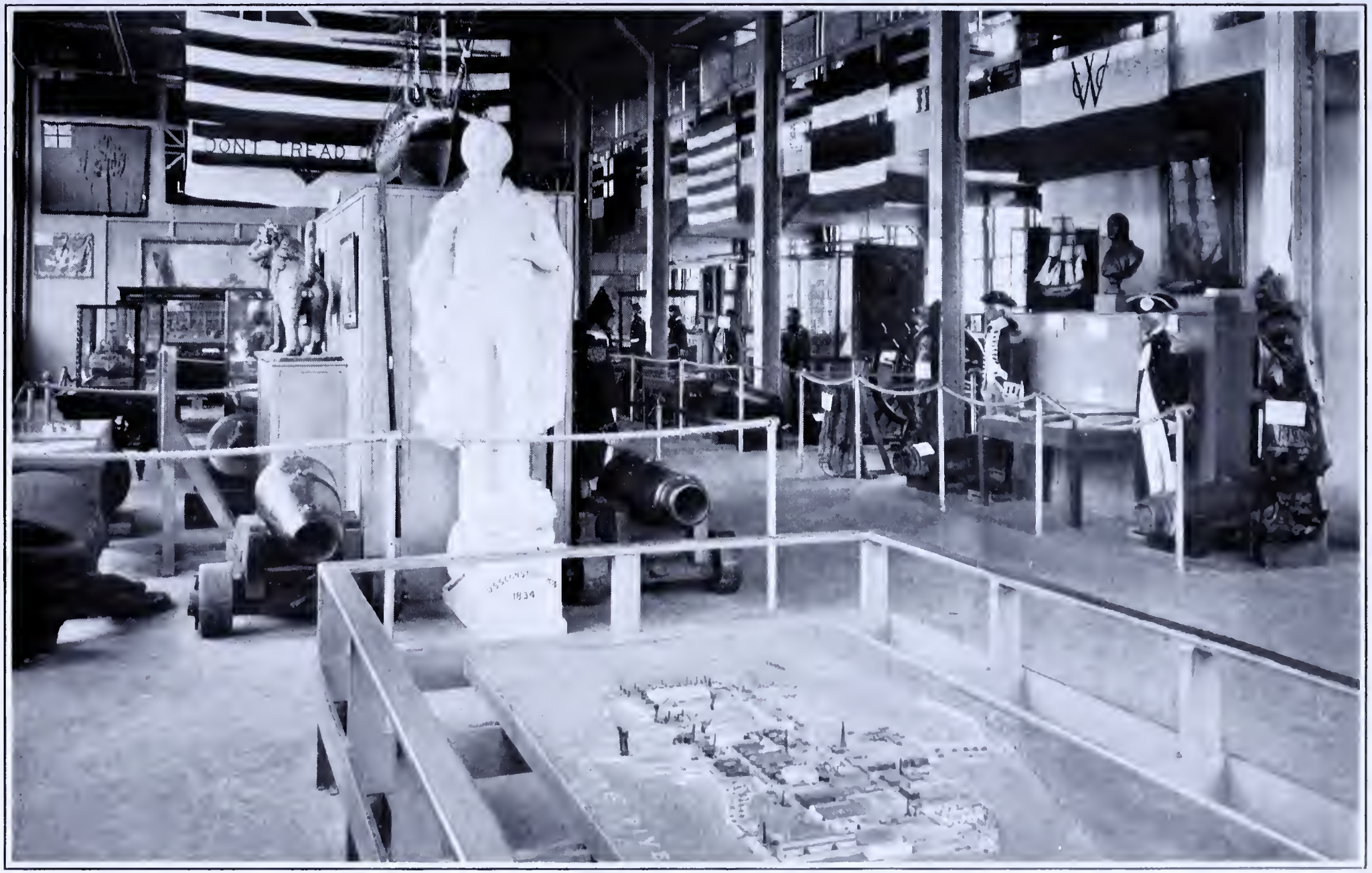

PLATE 46.—View of Naval Historical Exhibit.

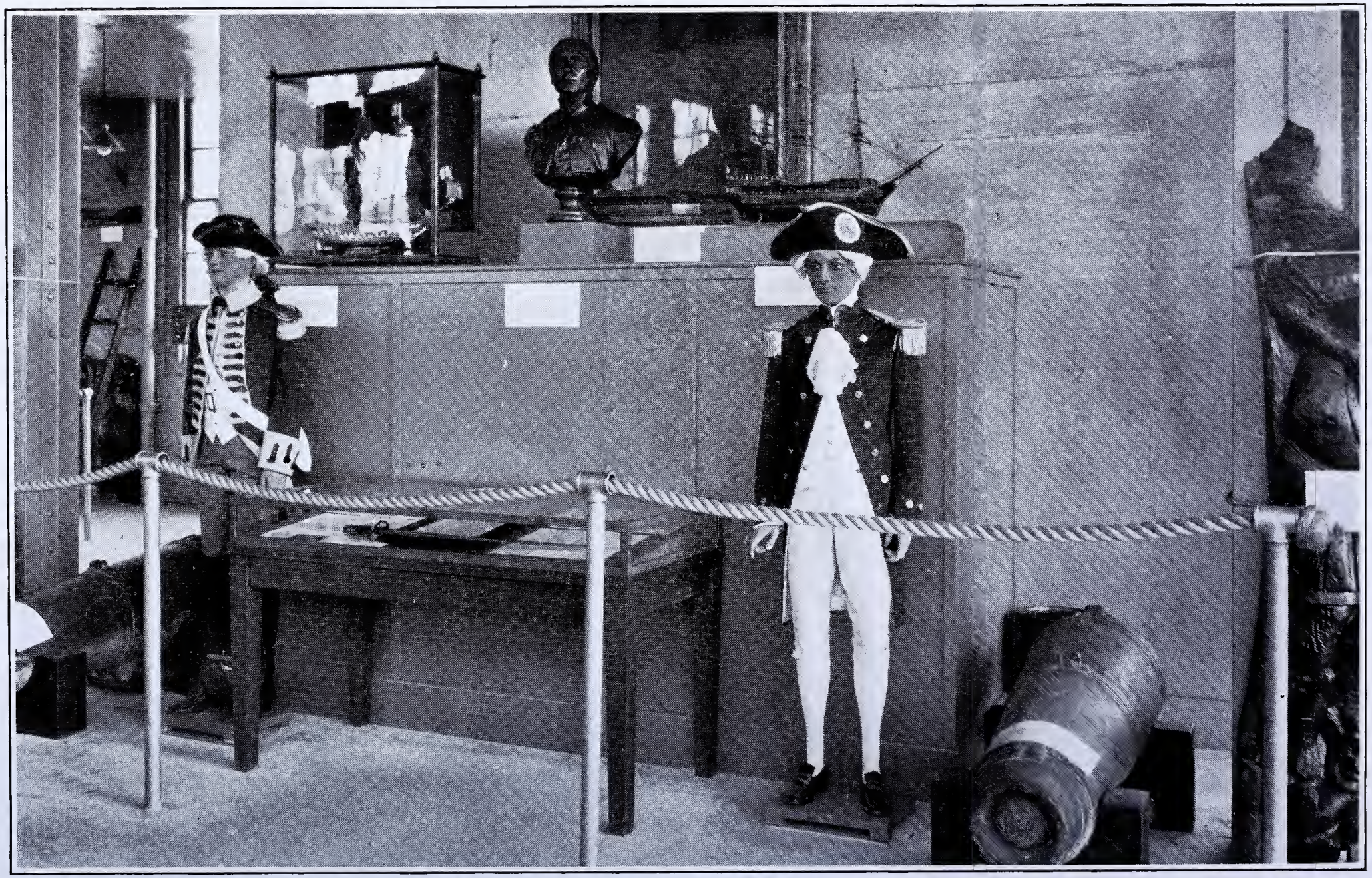

PLATE 47.—Naval Historical Exhibit—John Paul Jones group—Revolutionary War relics.

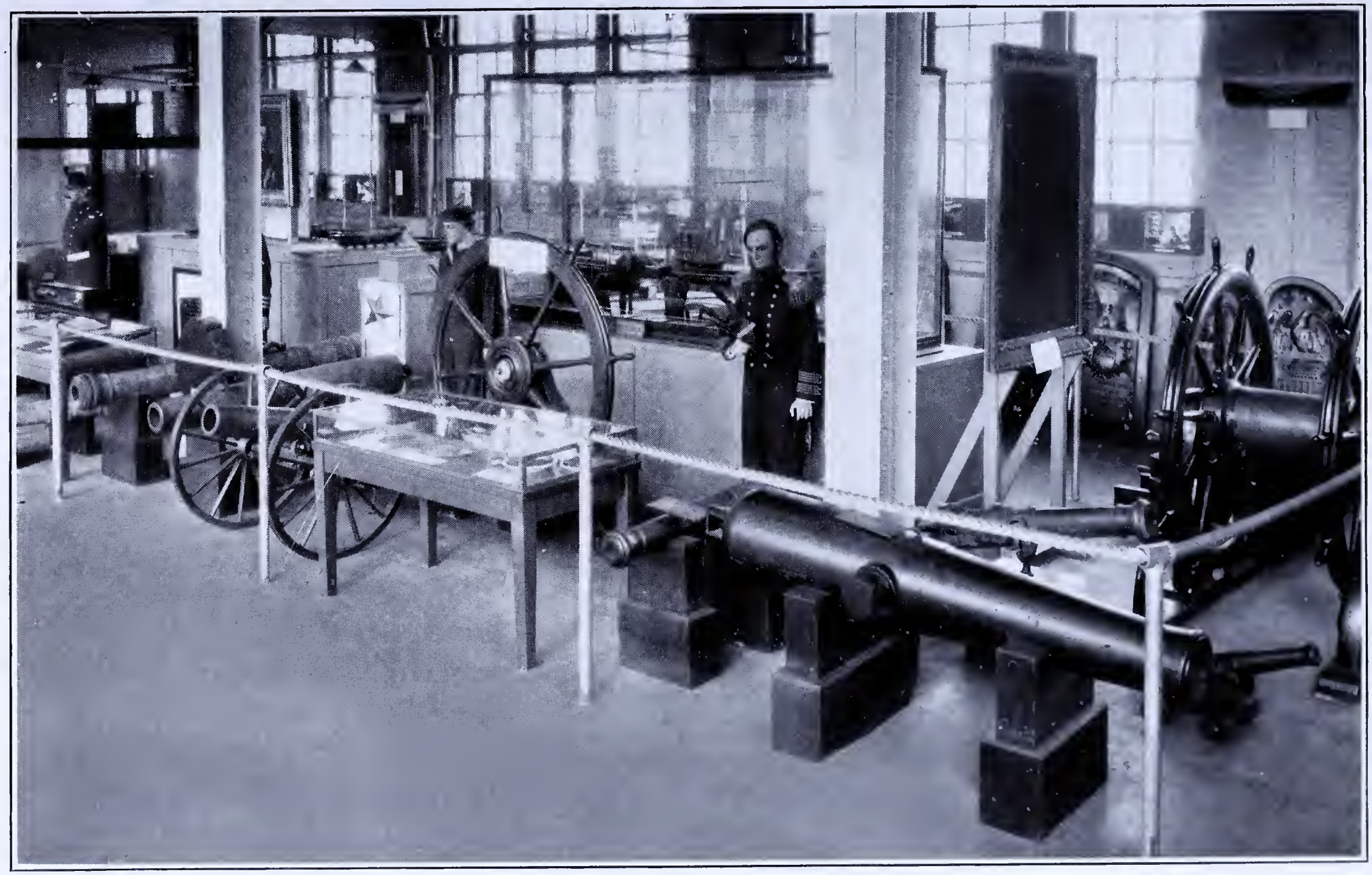

PLATE 48.—Naval Historical Exhibit—Civil War relics.

all the buildings, aircraft factory, flying field, docks, dry docks, hospital, radio masts, etc. (Plate 46). In the southeast corner was the case containing models showing the development of the warship from 1776 to the present time. This collection of ship models to uniform scale (1/8 inch equals 1 foot) enabled the observer to visualize the increase in size, as well as the change in type. The models shown in this case were: *Bon Homme Richard, Constitution, Ohio, Hartford, Monitor, Merrimac, Chicago, Brooklyn, Oregon* and *Lexington.*

Relics of the Revolution

To the right of the entrance and next to the information booth, was the block devoted to relics of the Revolutionary War. (Plate 47). This section contained two figures in reproductions of the uniforms worn by officers of the Navy and the Marine Corps; also there was exhibited the service sword of John Paul Jones, a document in his own handwriting, a bust of this early Naval hero by Houdon, and a model of a fishing ketch. Vessels of the ketch type, manned by colonial fishermen, armed with very small cannon and rifles, were the forerunners of our Navy of today.

Relics of the War of 1812

Facing the entrance the visitor found the War of 1812 block. High up on a pedestal under the flags she carried, was the large and fine Barnes' model of the *Constitution.* In front of this stood the Jackson Figurehead which was mounted on her in 1834. On the right side of this pedestal were figures in the uniforms of captain and bluejacket of this period. Also portraits of her famous commanders Bainbridge, Hull, and Stewart, and in a case below them, flanked by guns captured from the British frigate *Cyane,* were the swords used by them. On the left side were the *Constitution's* original plans, an ornamental lion captured from the British ship *Macedonian,* two huge blocks used to careen "Old Ironsides" for painting the bottom, and in a case were original documents in the handwriting of her commanders.

Civil War Relics

Further along were the Civil War relics. (Plate 48). In this subdivision were the beautiful oil portrait of Admiral David Glasgow Farragut, the wheel of his famous flagship, the *Hartford;* several guns captured from Confederate ships and forts; models of the *Monitor* and *Merrimac* with portraits of their commanders, Rear Admiral John L. Worden and Captain Franklin Buchanan. There also

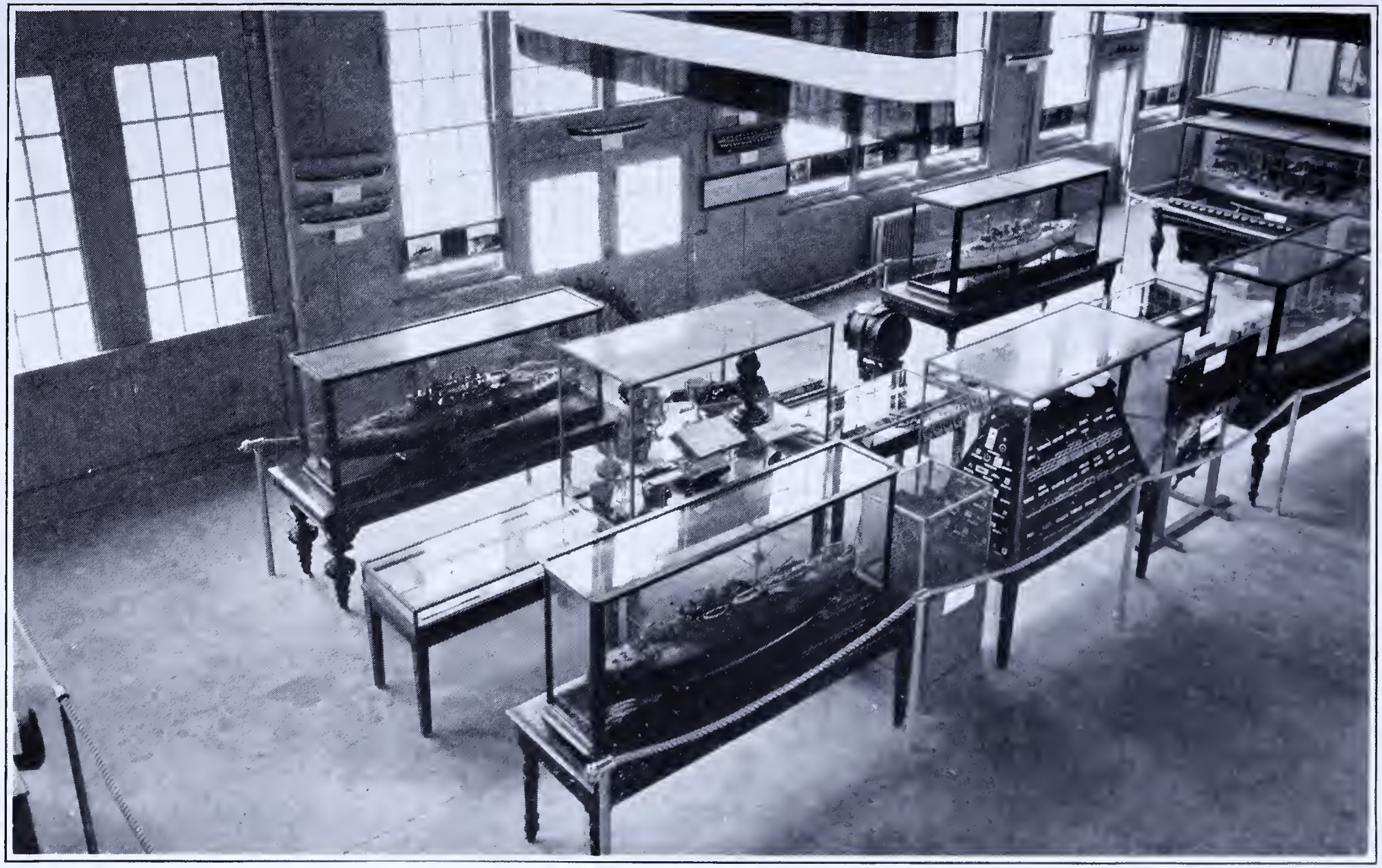

PLATE 49.—Naval Historical Exhibit—Spanish War relics.

was the stern post of the U. S. S. *Kearsarge* containing the unexploded shell fired into it by the C. S. S. *Alabama*. A replica of the rations issued to Navy crews during the Revolutionary, Civil and World Wars, and a model of the *Powahatan*, the ship that carried Commodore Matthew C. Perry on his mission of peace to Japan in 1852 to 1854 were also in this group of relics.

Across the aisle from this section was the one devoted to mementos of the Spanish War. (Plate 49). Here were the portraits of Admiral Dewey, the bell of the *Maine* recovered from Habana Harbor, guns, flags and trophies from Spanish ships and models of the famous *Oregon*, *Brooklyn* and *Olympia*. There were also located here sleeve devices and stripes worn by the officers, and the rating badges worn by the various branches of enlisted men in the Naval Service, together with the medals issued for the various campaigns and for meritorious and conspicuous conduct in battle.

Along the walls were the beautiful carved gangway head boards of some of the old ships of the Navy, models showing hull forms, and at all the windows throughout the building were transparent photographs depicting the activities, life and customs of both the old and the modern Navy.

Overhead on the first floor of the building hung the set of military and naval flags showing the origin and evolution of our flag.

United States Naval Academy

As the visitor passed into the modern section, he saw first the reproduction of a Midshipman's room at the U. S. Naval Academy at Annapolis, Md., showing the location of the furniture and the stowage of clothing. There were also three figures dressed in the uniform of Midshipmen showing the working, service, and dress uniforms. Across from the room, the walls were covered with photographs showing views of the Academy grounds, the life and activities contained therein, and the trophies and prizes given for scholastic and athletic achievement.

On the right near the Midshipmen's exhibit was a library of 1,000 volumes containing not only technical books but also the latest works of fiction and travel. The library on exhibit will be installed on the U. S. S. *Lexington*, upon the commissioning of that vessel early in 1927. In conjunction with the library was shown a complete exhibit of Navy educational courses for every branch of the service. These courses are used to stimulate interest and encourage advancement and promotion of the enlisted personnel of the Navy.

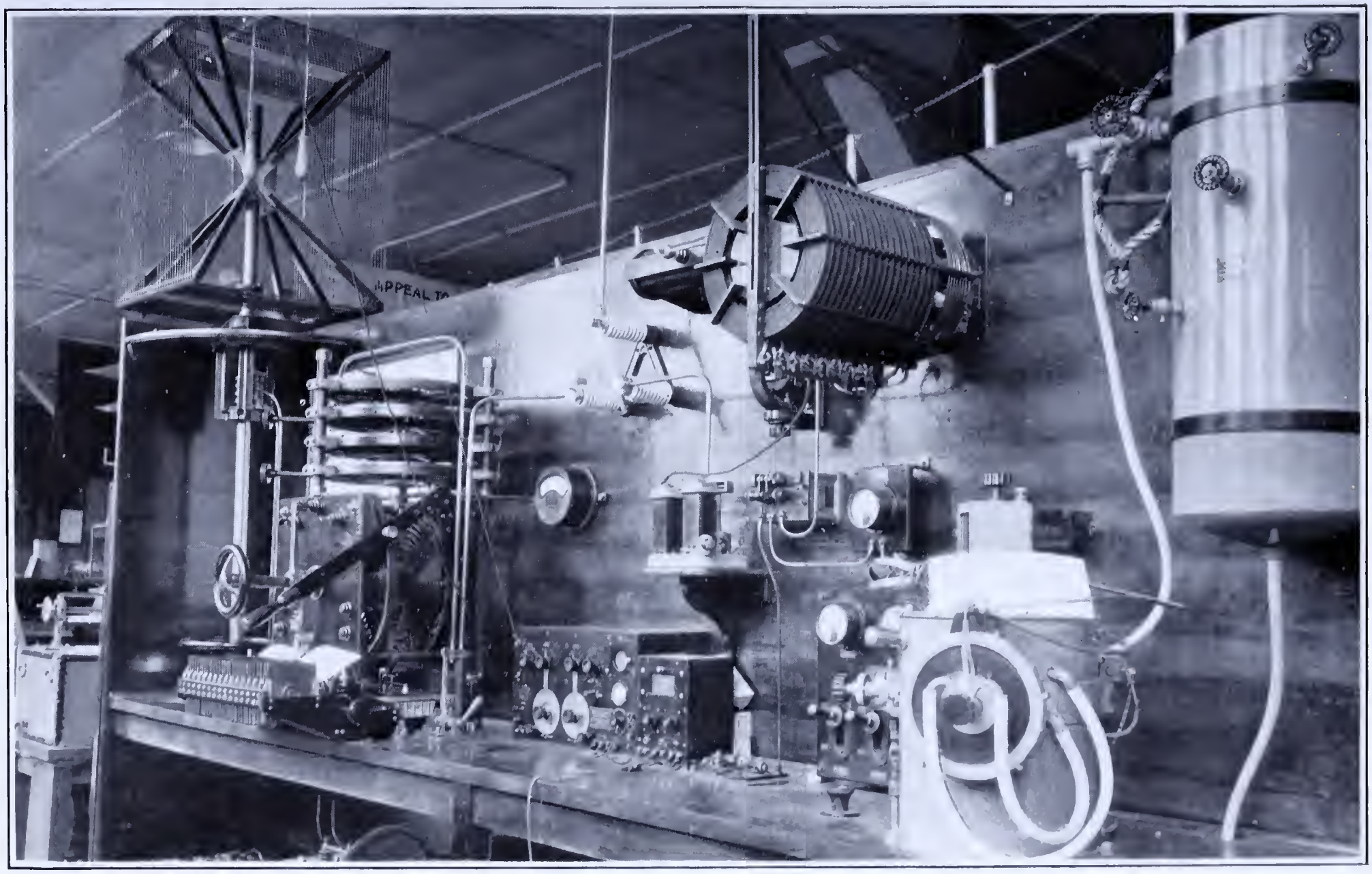

PLATE 50.—Navy Exhibit—Radio Sound Apparatus.

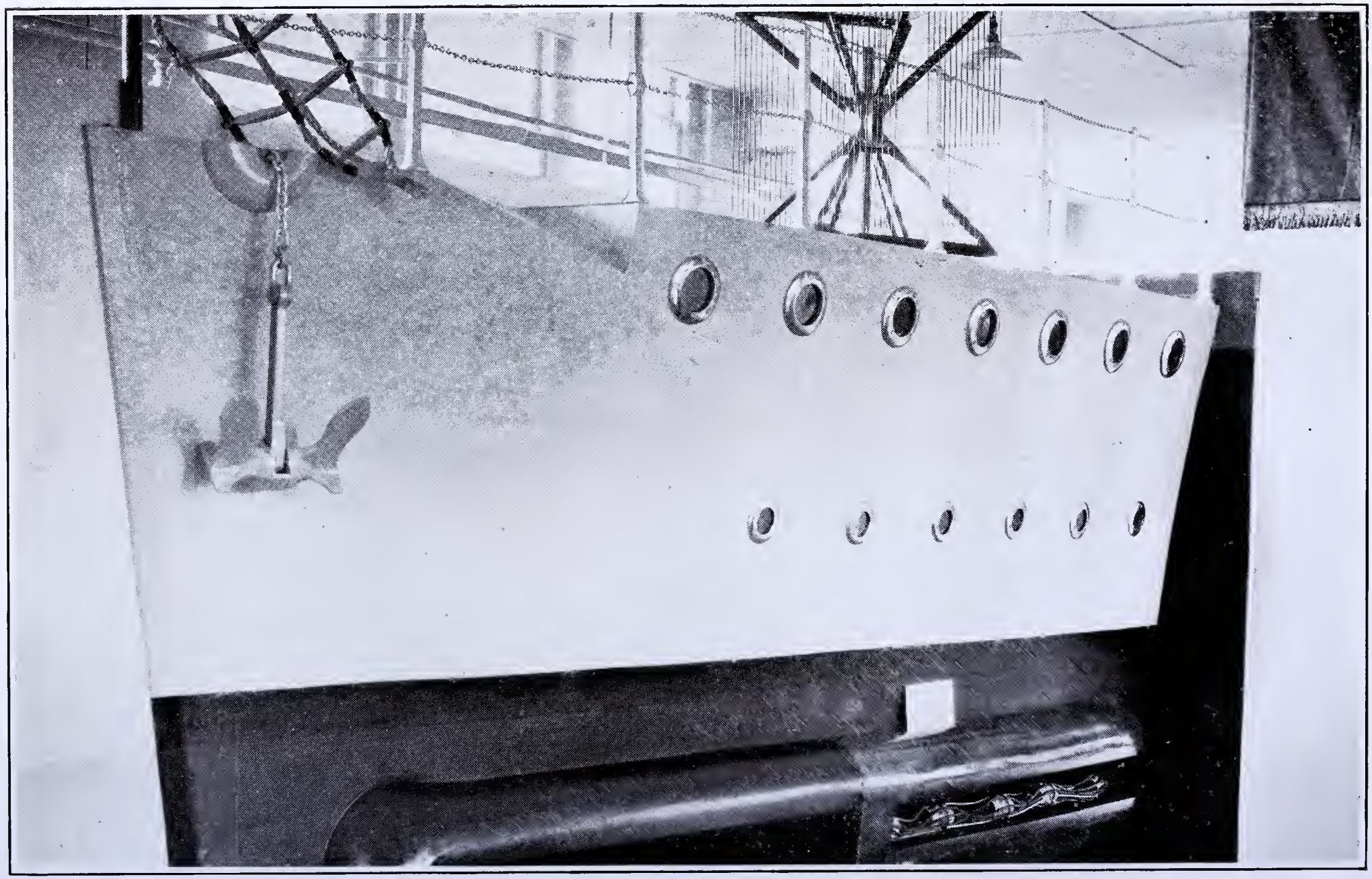

PLATE 51.—Navy Exhibit—Sonic depth finder.

PLATE 52.—Navy Exhibit—Aviation Material.

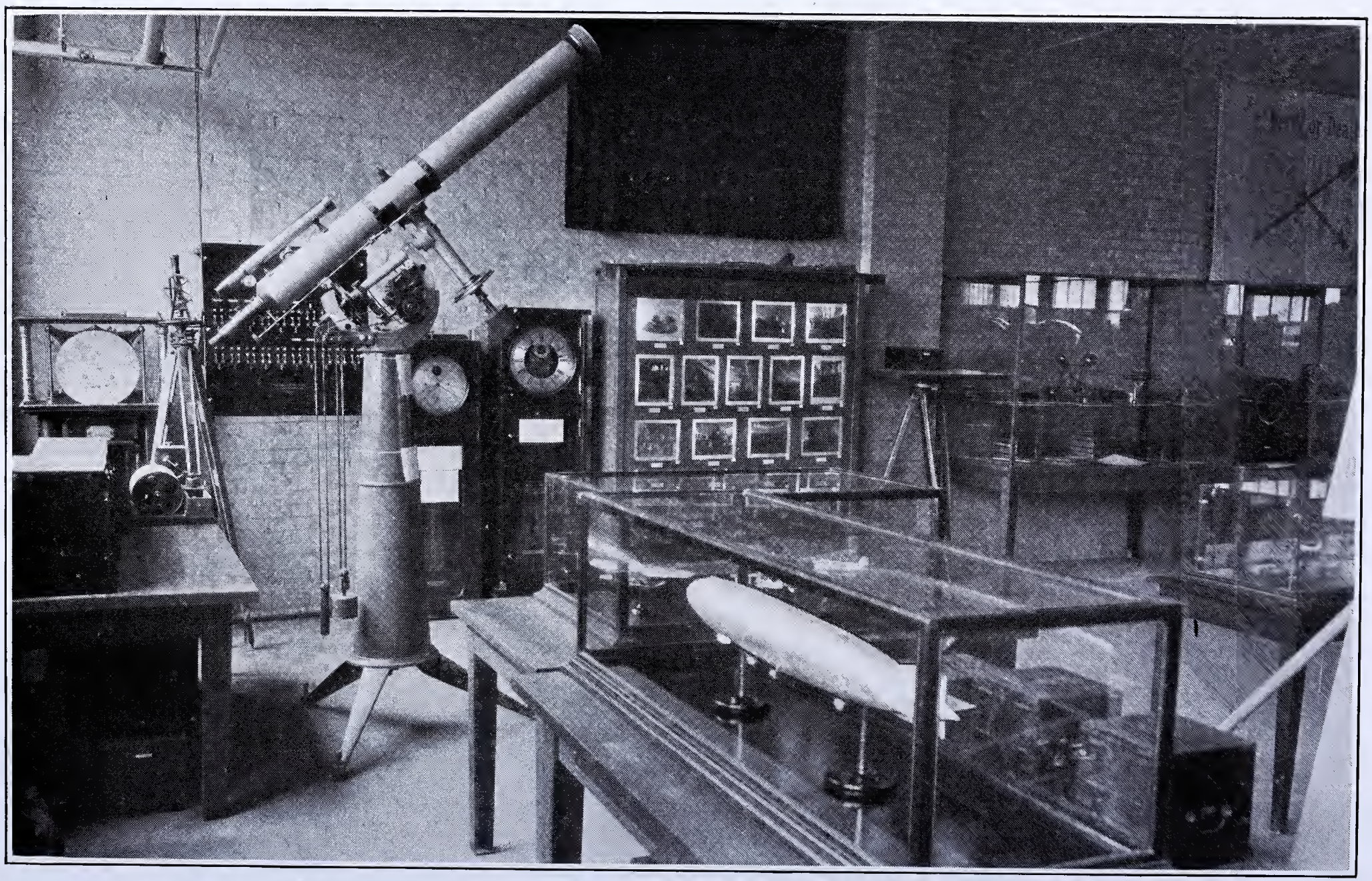

PLATE 53.—Naval Observatory—Time Service Instruments.

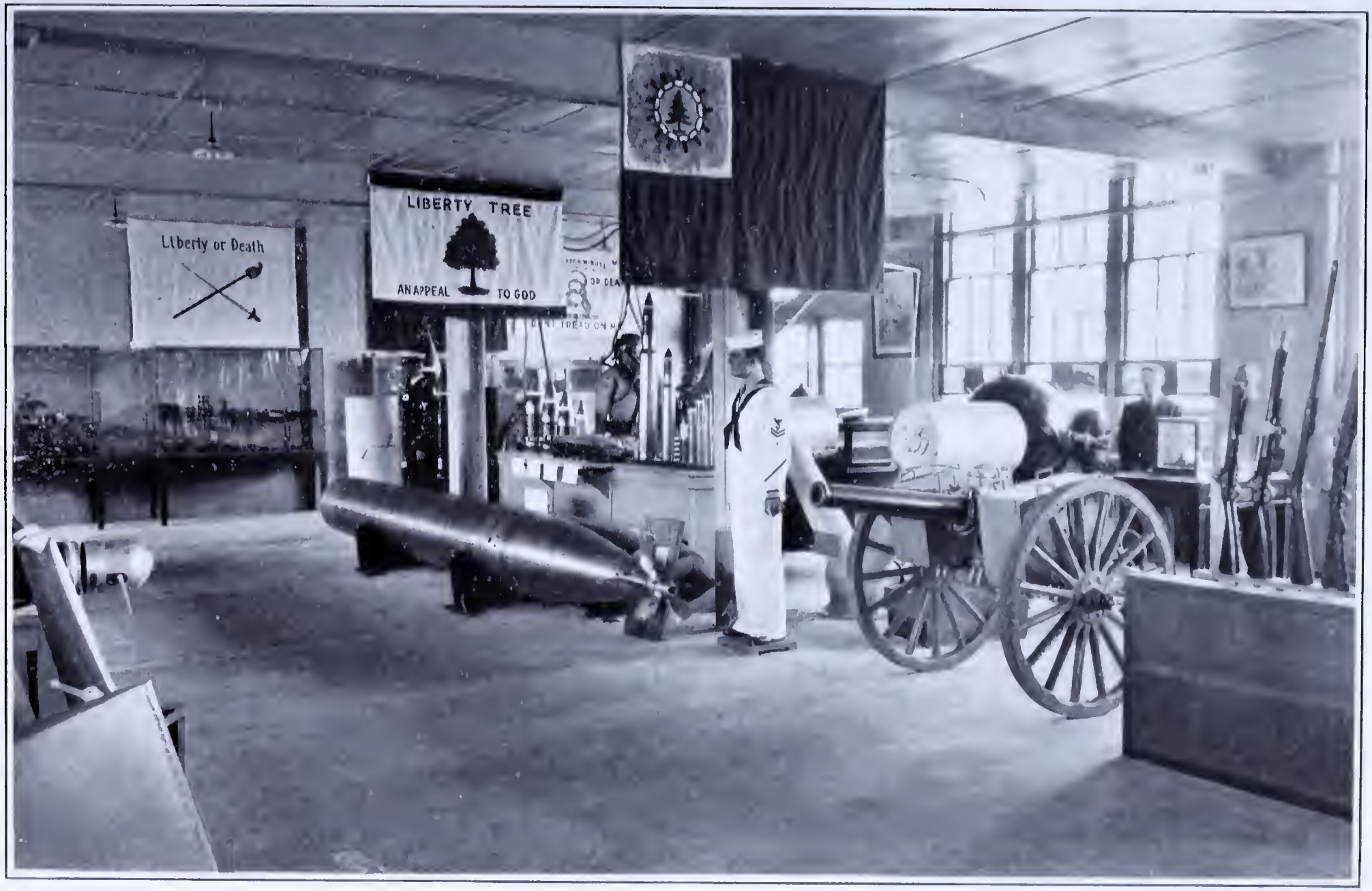

PLATE 54.—Navy Exhibit—Naval Ordnance Material.

Special Exhibits

Across from this exhibit on the left was a case containing the snow shoes worn by Rear Admiral Robert E. Peary on his final and successful expedition to the North Pole in 1919. There were also here his portrait and the Navy League flag carried by him to the Pole.

To the left of this was the Engineering exhibit which showed the latest methods of communication by sound, through the air by radio, and under the water by oscillators. (Plate 50). Also the receiving apparatus necessary for detecting and listening to these sound signals. A modern sonic depth finder was included in this exhibit, all of which was mounted on a reduced scale model of a part of a modern destroyer. (Plate 51).

Toward the rear of the building on the left hand side, was an exhibit of aviation material showing models of all types of planes used in the Navy and a model of the *Los Angeles* with its hangar. (Plate 52). Three different types of airplane motors and a Liberty motor so cut that one could see all parts were also shown in this exhibit. The greater part of the Naval aeronautical exhibit was at the Naval Aircraft Factory.

Against the rear wall of the building was the exhibit of the Naval Observatory. (Plate 53). This exhibit consisted of three very accurate clocks, electrically connected to a chronograph so that time signals could be sent out to the country; very interesting old navigational instruments as well as modern instruments of types supplied to ships and those utilized for determination of time were shown.

Naval Ordnance Exhibit

In the right hand or northwest end of the building was found the exhibit of Naval ordnance material. (Plate 54). A model of the Navy's 14-inch railway battery used during the last war, a working model of a modern three gun turret, an actual mine such as was used in the North Sea and laid by the U. S. Naval Forces, a 3-inch anti-aircraft gun, airplane bombs of 300 and 500 pounds, a complete Navy deep sea diving outfit; shells used in our Naval guns from 16-inch to one pounder and the huge stack of powder required to fire a 16-inch shell were among the objects shown. There also could be compared our twenty-one-foot torpedo with the sixteen-foot torpedo captured from the German Cruiser Geier.

Medical Exhibit

On the mezzanine floor was the Medical exhibit, consisting of a contrast of the "sick bays," old and new. The surgeon's cockpit of the

old *Constitution* was reproduced to scale. In this compartment about five feet high, operations were conducted on a plain wooden table lighted by whale oil lamps. Anesthetics were unknown and pain was deadened by drugging the patient with laudanum and rum. Vinegar was used as a deodorant and a bucket of sand caught any blood that flowed. Oakum and spun yarn were the only surgical dressings. The small kit of knives, while of excellent steel, could not be cleaned easily because of the carved bone handles. Alongside this was the modern sick bay containing the finest surgical instruments and appliances known to science. A fully equipped battleship dental office and a collection of medical books were also shown.

Nearby was a display of the equipment, old and new, of the U. S. Marine Corps and some of its trophies. The principal Marine Corps exhibit was the model camp in which the Forty-third company, Fifth Regiment, lived on the Exposition Grounds.

Hydrographic Office Exhibit

On the mezzanine floor was also a section showing the development of nautical charts by the Hydrographic Office of the Navy; this included the charts and nautical publications furnished at cost to our Merchant Marine as well as to the Navy. There was graphically illustrated the steps in the construction of a chart from obtaining soundings and hydrographic data by the survey ships to the finished product. Some very interesting old charts showing the location of the best whaling grounds, prepared by Lieutenant Mathew Fontaine Maury in 1831, were also shown.

On a raised platform in this section of the building were models of the various types of submarines, including a model of the V-1, newest and largest submarine. The mezzanine gallery over the historical section contained models of modern ships.

The effect striven for and which it is believed was attained was to have the exhibit illustrate to the visitor the intimate part that the Navy has played in the history of the United States, and the development of the Navy since the War of the Revolution.

United States Marine Corps Exhibit

The Model Camp of the Marine Corps was attractively situated in the southwest portion of the Exposition Grounds between the Coast Guard Station and the Army Camp. Men and Officers lived under

canvas; a mess hall, galley and recreation room were constructed of wood, well screened. Especial attention was paid to the beauty of the arrangement, hedges and flowers were planted, and many favorable comments from visitors resulted. In order to give a nautical touch to camp, two 3-pounder guns on cage mounts were placed in the company street, a flag pole with yard-arm was erected, the ship's bell from the old Minnesota sounded the hours of the watch, and a Navy cutter with one-pounder gun mounted in the bow was placed nearby. Before the Company Commander's tent was mounted a silver and gold Marine Corps device, carved in laminated wood.

Camp Samuel Nicholas was open to visitors from 8 a. m. to 8 p. m. daily and Sunday; Tun Tavern from 10 a. m. to 10 p. m. likewise. Sentries were stationed at each of the two exhibits, and a sergeant was daily on duty at camp as a special host to guests. Everything in camp was open to inspection at all times during visiting hours. The galley seemed to be the most interesting feature, and many people were particularly interested in an exhibition of infantry weapons and trumpet calls from 1.30 to 2.15 p. m. Pistols, machine guns, rifles, grenades, infantry pack, and entrenching tools were spread out on a table in the company street, and a Roll of Honor, bearing the names of the men of the company who had died in the World War, and a tabulated list of the decorations and citations for gallantry awarded to its members, was displayed where it readily caught the eye.

The replica of Tun Tavern, hard by the camp, was constructed by employees of the depot of supplies, and represented faithfully the exterior of the famous inn that once stood on Water Street, Philadelphia, where Captain Samuel Nicholas of the Marines recruited the first men of the Corps during the American Revolution. His commission bears date of November 28, 1775, eighteen days after Congress had authorized the establishment of two battalions. The interior was designed to contain eleven oil paintings, tracing significant events in the history of the Marine Corps from the Revolution to the World War. A search light, trained upon the building at night, brought its interesting lines into bold relief, and this exhibit was thronged with visitors.

THE DEPARTMENT OF THE INTERIOR

THE DEPARTMENT OF THE INTERIOR

Foreword

The essentials of a good exhibit are clearness of expression, simplicity of design, attractiveness in presentation, and effectiveness in impressing upon the minds of visitors visions of past accomplishments, present activities, or of future possibilities. The Department of the Interior was most successful in developing a large number of exhibits possessing these features; the Department was particularly happy in its choice of subjects to demonstrate that it is preeminently a "fact-finding department for internal development."

The exhibit was a popular one. The beautiful facade that extended along the main aisle, carrying in a central panel a series of pictures illustrating some feature in each of the bureaus, invited all to enter the space behind and examine the objects conveniently arranged there for inspection. Visitors did enter, and lingered to examine the arts and crafts shown by the Indian Bureau, the magnificent scenes from our National Parks, the amazing development of agricultural lands under the Reclamation Service, the large collections and models illustrating the work of the National Bureau of Education, the maps showing our territorial development, the stories of departed heroes whose bravery and devotion secured and maintained possession and unity of what has become the greatest and richest republic in history. These and many other subjects of educational value and beauty were a source of instruction and enjoyment to all who saw them.

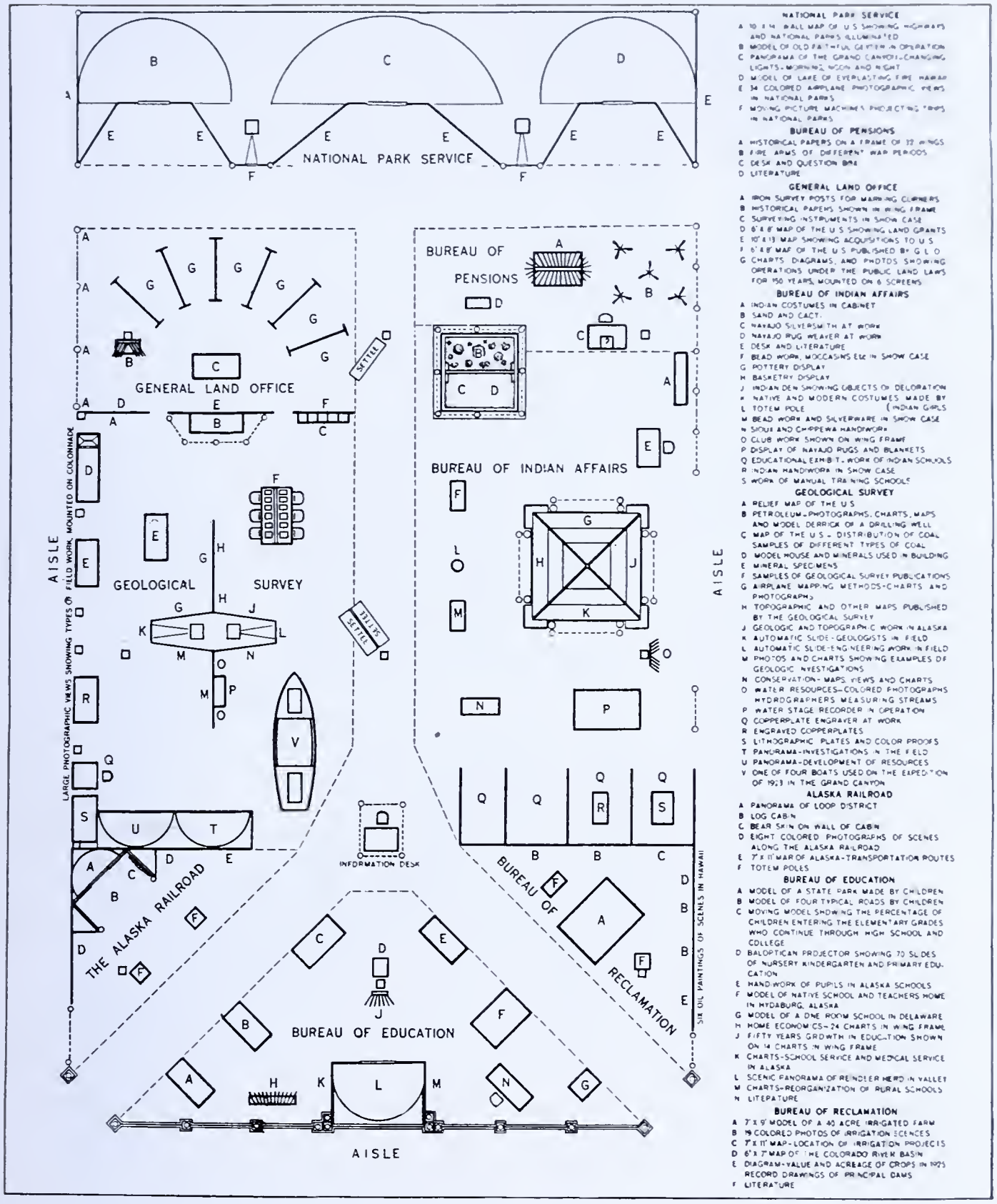

PLATE 124.—Floor plan. Interior Department exhibit.

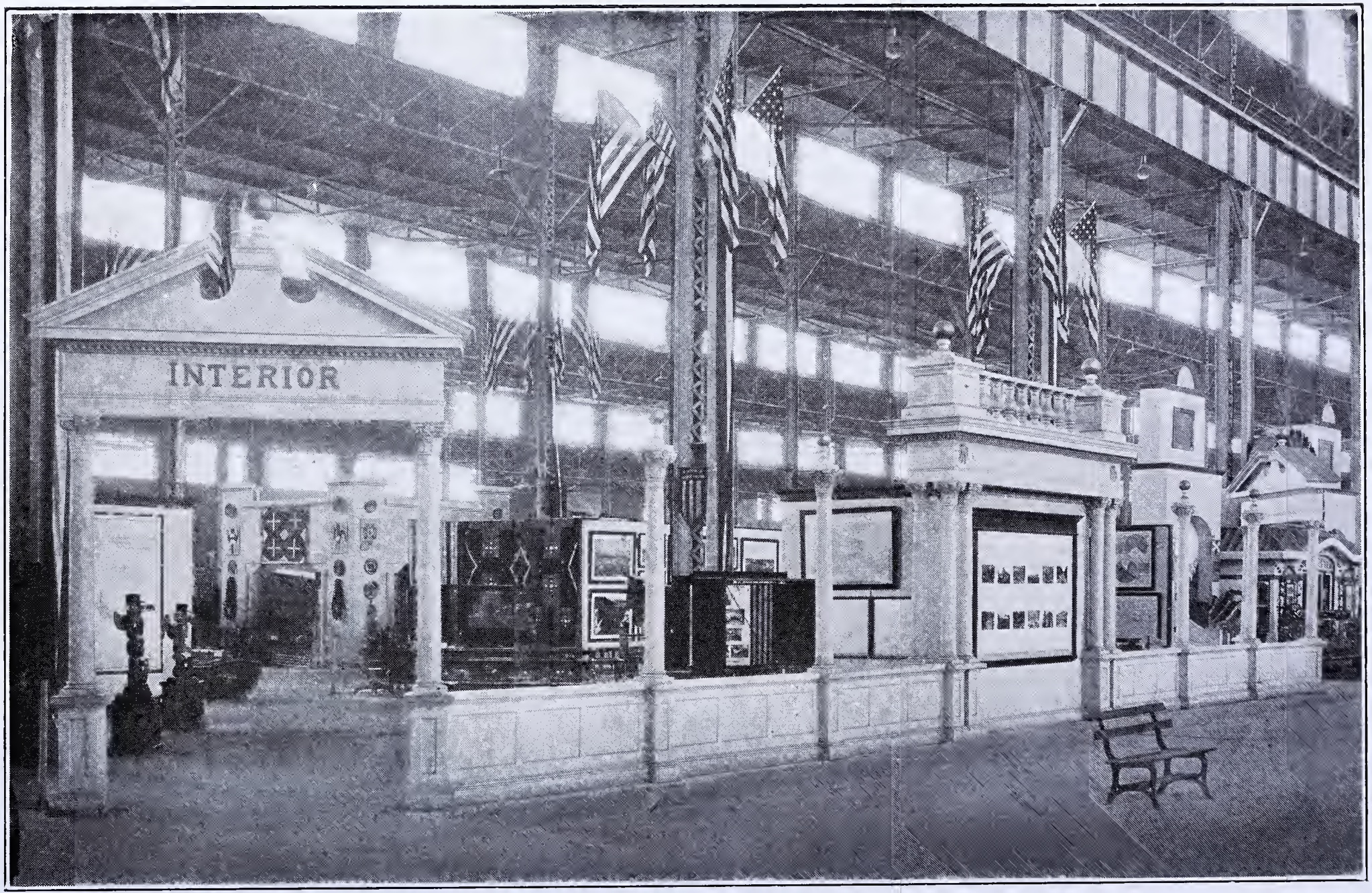

PLATE 125.—Interior Department Exhibit. Collonade, looking through northeast entrance.

Exhibits of the Department of the Interior
at the
Sesquicentennial Exposition
1926

Introduction

The United States Department of the Interior has been aptly described as the Land, Home, and Education Department of the Government. It is a fact-finding department for internal development, which its exhibits (Plates 124 and 125) fully demonstrated.

Through the Geological Survey the Department has explored illimitable fields for the development of our mineral resources and added to the topographical knowledge of the United States; through the Bureau of Reclamation it has reclaimed arid and semi-arid lands in the West and opened them up for settlement, besides making contributions to the science of irrigation and hydraulic engineering.

Through the Bureau of Education, which has been called a "clearing house for educational information," the Department has stimulated the cause of public education in the United States; through this Bureau it operates directly 86 schools for the natives in Alaska. Through its Bureau of Indian Affairs, the Department has charge of 205 schools for the American Indians, and conducts important welfare work. In addition to these educational activities, the Department maintains the Columbia Institute for the Deaf; Howard University for the higher education of the colored race; and training schools for nurses at Freedmen's and St. Elizabeth's Hospitals, with a graduate school for psychiatrists at the latter institution.

The Department of the Interior through the General Land Office has to do with matters relating to the disposal of public lands, and the keeping of valuable records connected therewith.

Through the National Park Service the Department preserves for study and observation the relics of prehistoric races, the flora and fauna of the country, natural scenic wonders of surpassing interest and grandeur, and adds greatly to our scientific knowledge of these subjects. The National Parks, in reality, constitute colossal museums of natural history and anthropology.

Through the Pension Office, the Department handles large financial transactions involved in the payment of pensions to veterans of the wars, and affords opportunities for historical and genealogical studies through its records of the Revolutionary War, War of 1812, and other wars.

PLATE 123.—Outside view, Interior Department Exhibit.

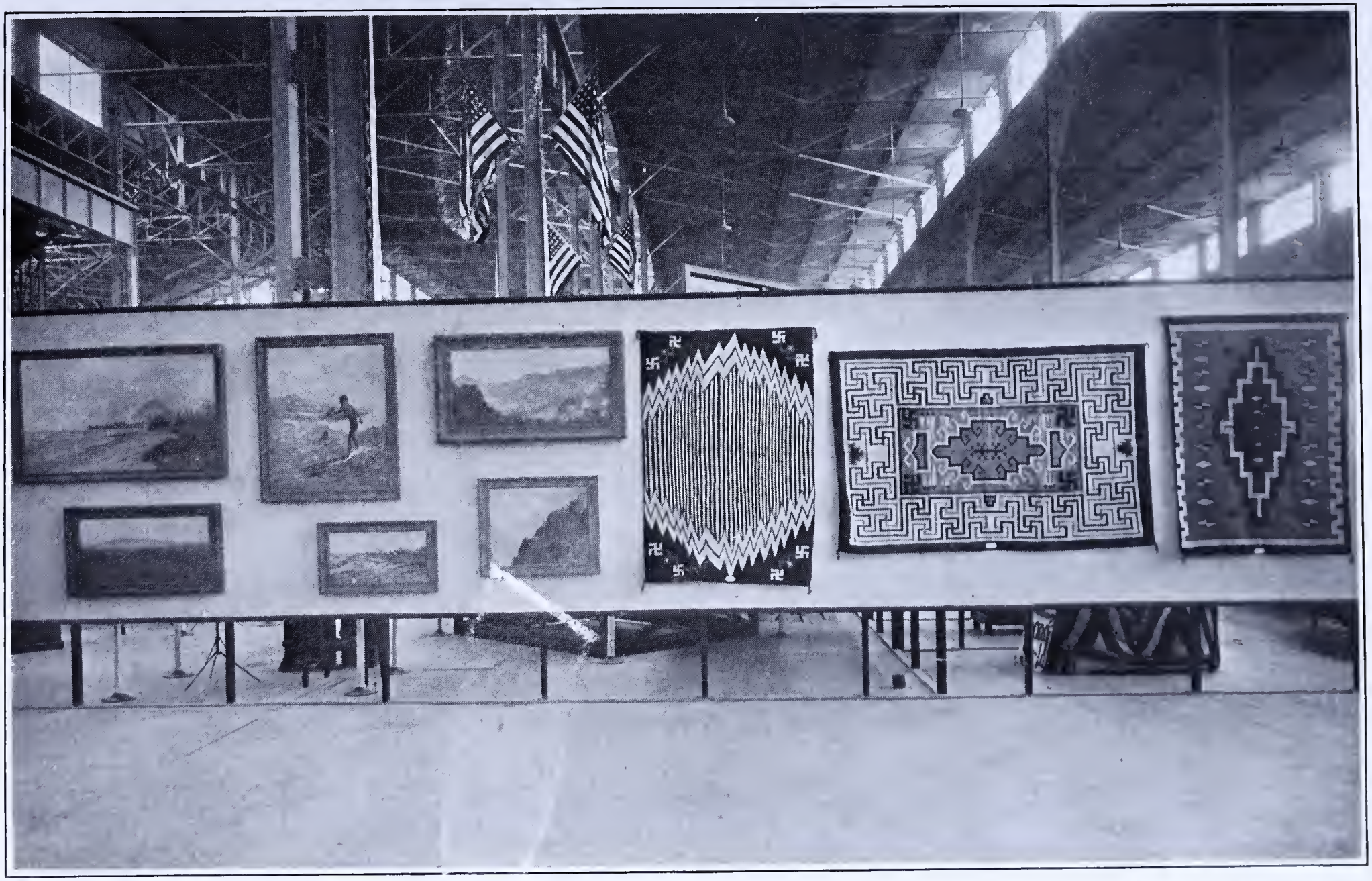

PLATE 127.—Portion of west partition wall, Interior Department Exhibit, showing Hawaiian oil paintings and Indian rugs.

Through the Alaska Railroad, authorized by Congress in 1914, and completed in 1923, the Department stimulates passenger, freight, express and mail service in the Territory of Alaska. (Plate 126).

In one sense of the term, the Department is a postgraduate school for original scientific research, and might well be called a "Federal University for the People."

Many of the different Federal activities in Alaska and Hawaii (Plate 127) are under the supervision of the Department of the Interior, and were represented in the Sesquicentennial Exposition, but for the most part these exhibits were displayed in other buildings than that devoted exclusively to the Government.

The following publications were distributed free to visitors to the exhibit in the quantities indicated:

39,000		"Irrigation Projects"
264,000		Post cards
6,000	copies	"Then and Now"
5,000	"	"Glimpses of Our National Parks"
1,500	"	"Glimpses of Our National Monuments"
1,500	"	"New Reclamation Era"
500	"	"Story of the Declaration of Independence"
250	"	"School Life"
50	"	List of publications of the Bureau of Education
1,000	"	"A Federal University for the People."

Description of the Exhibits

General Land Office

The exhibit of the General Land Office was designated to show graphically how the public domain was acquired, its extent, and the manner of its disposition under the various laws of Congress during the past 150 years.

A study of this exhibit showed the vast extent of the territory of the United States which has been administered and title granted through the General Land Office, and the importance of the records of that office which are being continually consulted in the matter of title to lands which have become incalculably valuable. It showed also the gradual development of the United States in settlement, home building, improvements, and transportation, and, in fact, everything that goes to make up a great country.

Copies of State maps in the course of preparation by the General Land Office; that is, from the bare outline through the progressive steps to the finished map were displayed on screens. The map of all

PLATE 128.—Maps and surveying instruments, General Land Office exhibit.

the public land States in the Union and the large United States map are compiled and issued by the General Land Office. Charts showing the different kinds of surveys, such as township survey, mineral surveys, etc., were exhibited, together with other charts presenting the progress made along certain classes of work handled by the General Land Office. A wing frame contained many historical documents, such as a copy of the first patent issued by the United States dated March 4, 1788, for lands in the State of Ohio, which were sold at auction in the city of New York and the plat of the first survey made under the rectangular system; warrants issued to George Washington for services in the Virginia Continental Line, granted by Virginia; warrant to Paul Jones; to Abraham Lincoln for services in the Black Hawk War; and warrants issued for services in the Mexican War to Winfield S. Scott, Robert E. Lee, David G. Farragut, Thomas I. ("Stonewall") Jackson, Ulysses S. Grant, William T. Sherman, Philip H. Sheridan, and Ambrose E. Burnside. The above-mentioned case also contained patents for lands signed by President Andrew Jackson, John Adams, James Madison, and John Quincy Adams, likewise a relinquishment of lands signed by Major General Lafayette on October 2, 1823, in Paris.

Large map of the United States.—The large map of the United States, about 10 feet by 13 feet, showed the territory of the United States and the manner in which it has been enlarged from time to time.

Surveying accessories.—A glass show-case contained many items of interest illustrating the instruments and methods, past and present, employed in surveying the public lands. (Plate 128). Contrasted with the modern surveying instruments, including the solar transit, long steel ribbon tape, and clinometer, were exhibited the obsolete open-sight compass and old style 50 and 100 length chains of heavy wrought iron. With the display of the improved iron post filled with concrete and mounted with brass cap, used for permanently marking the corners of the public land surveys, were displayed original weather-beaten posts of wood that were actually set in the field in the surveys executed during the early history of our public land system. Blocks of overgrowth, or "scabs," evidencing marks enscribed on old witness or bearing trees, the ring growths of which record the years that have elapsed since the corners were established, and confirming the identification of corner positions that have been in dispute, were also exhibited in various forms. The case also contained the original deed from King George III of Great Britain to James Baird for 10,000 acres in Florida, executed in 1776, with a large wax seal of Great Britain attached.

Map of land grants to railroads, etc.—This map showed the extent of the grants of land made by acts of Congress to aid in the construc-

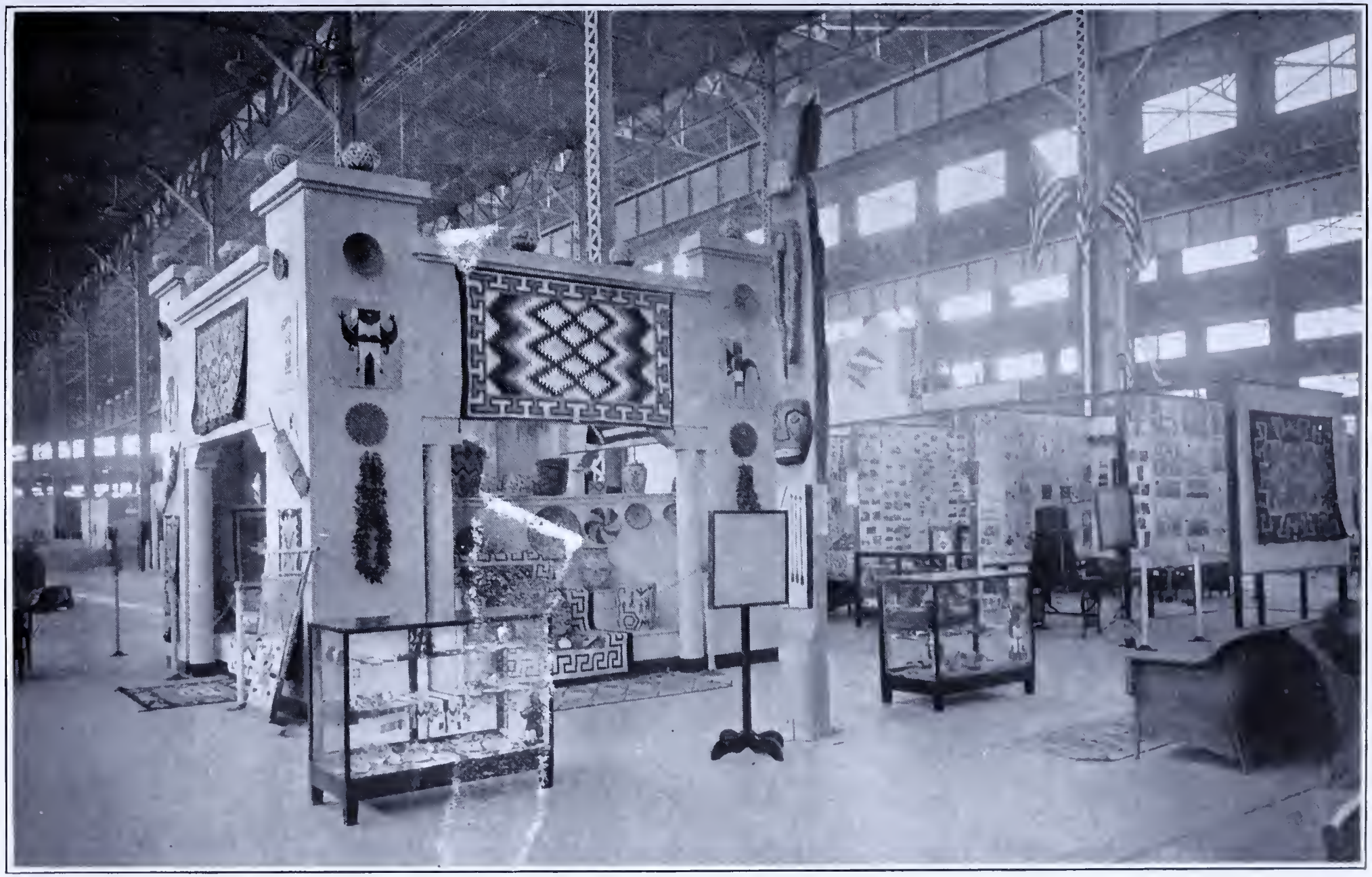

PLATE 129.—General view main portion of Bureau of Indian Affairs exhibit.

tion of railroads, wagon roads, and canals in the United States. The states of Iowa and Minnesota are almost covered by such grants, they being at that time the most thoroughly populated of the western states. Most of the grants were of every odd-section of land within certain limits running from 6 miles to 40 miles on each side of the line of road and under the grants about 140,000,000 acres have been patented.

Map showing approximate areas of unreserved and unappropriated public lands in the several states.—The map showing that part of the United States originally comprising the public domain was prepared to exhibit the present condition as to area of public lands remaining in each State. The green tint areas are not public land States. The white area contains no known vacant public lands and the red shade but small and scattered tracts. The other areas in the States run from 10,000 acres to more than 10,000,000 acres of unreserved, unappropriated public land.

Bureau of Indian Affairs

The records of the Indian Office reveal the fact that there are 349,595 Indians in the United States, an increase of 16,585 over ten years ago—a percentage of increase, over a ten-year period, of approximately four and one-half per cent.

The exhibit of the Bureau of Indian Affairs was designed to show the character and extent of the work being done by the Federal Government to make the Indians self-supporting and capable of taking up the duties and responsibilities of citizenship.

A central pavilion (modeled after the Pueblo style of architecture) was erected. This pavilion was 16 feet square, constructed to form four triangular booths, the base of each fronting outward and forming a side of the structure. The exterior walls were finished and colored to represent a Pueblo building or house, as far as could be done and still serve the purpose for which it was designed. (Plate 129).

The purpose of the pavilion was to illustrate the decorative possibilities of the native Indian arts and crafts, as well as their utilitarian uses. To this end the outer walls were hung with Navajo blankets. Apache and Hopi plaques and mats, Hopi paintings, Apache quivers with bows and arrows, and to give a touch of high color and emphasize the Pueblo atmosphere, a number of strings or loops of the bright red Chili peppers which are extensively grown and used by these most interesting people of the Southwest. Along the top of the wall were ranged 16 pieces of Pueblo pottery.

The pavilion booth facing north contained a collection of Indian clothing, aranged to show the contrast between the native costumes and

PLATE 130.—Indian booth, north alcove, containing a collection of Indian clothing.

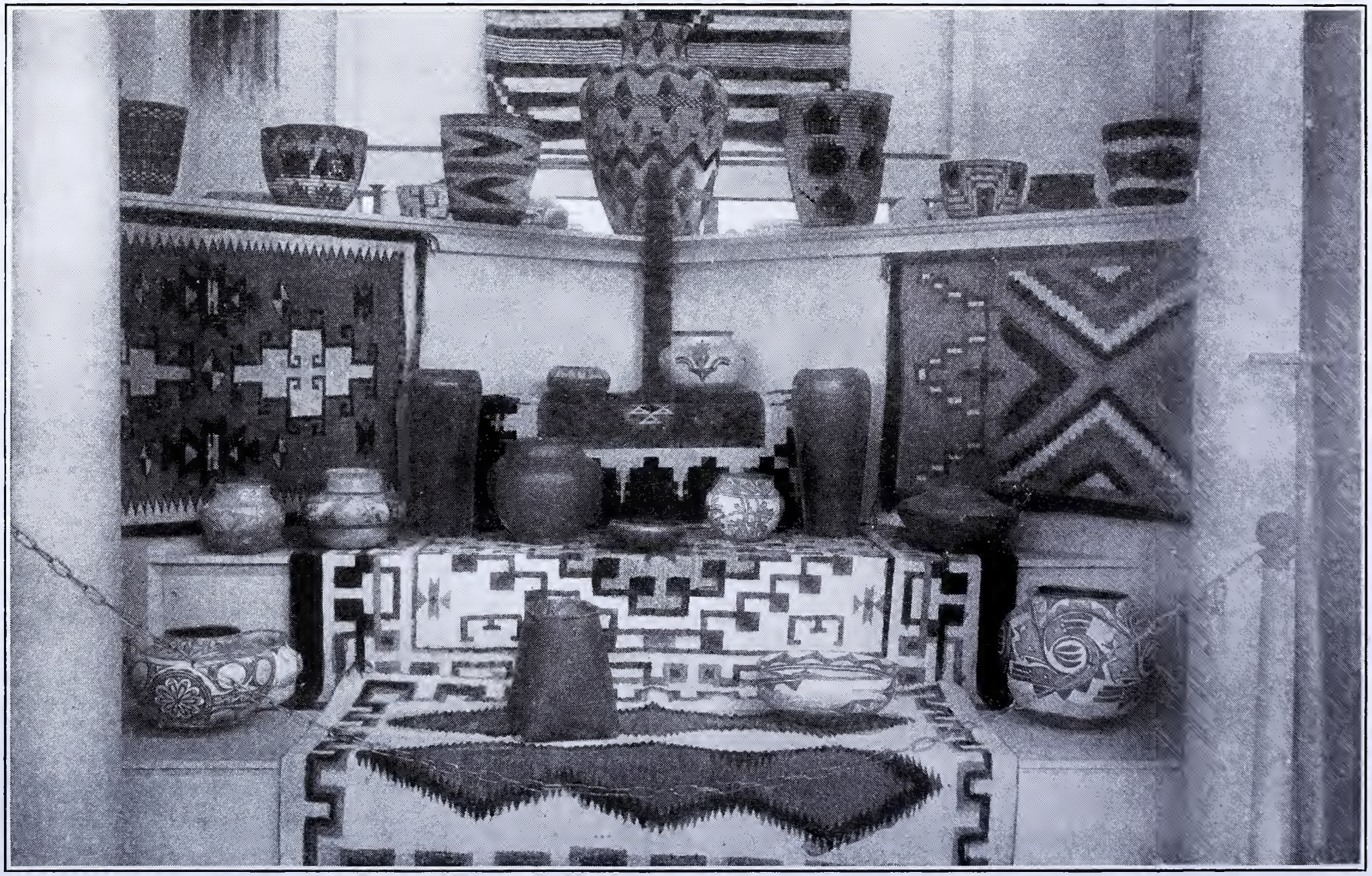

PLATE 131.—Indian booth, south alcove, containing Navajo rugs and collection of Hopi, Pima, and Pueblo pottery.

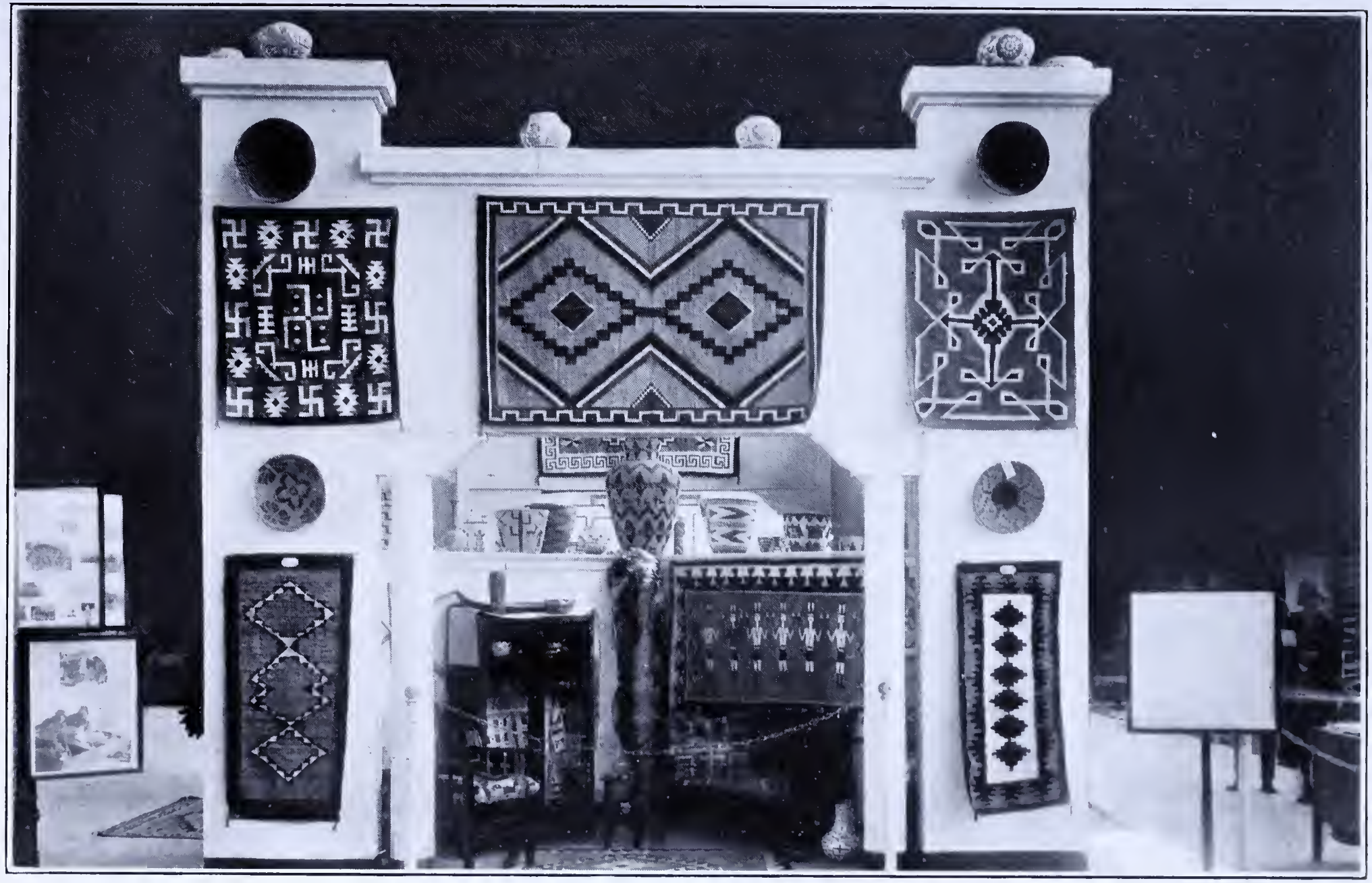

PLATE 132.—Indian booth, west alcove, containing specimens of Indian handicraft.

the modern style of dress which is rapidly taking the place of the cumbersome but picturesque native wearing apparel. (Plate 130). A collection of native Indian dolls was placed in this booth, made by Apache, Navajo, and Hopi Indians. In the booth facing each was a remarkably fine collection of Apache baskets and plaques, and a large Navajo rug. The south booth had three Navajo rugs, and collection of Hopi, Pima, and Pueblo Indian pottery, among which were two especially fine vases made by Nampoyah, a famous Hopi woman pottery maker. (Plate 131). The western booth of the pavilion contained a collection such as might be made by one who is interested in Indians and who has traveled somewhat extensively in the Indian country. (Plate 132). The material was artistically arranged to show how a corner of a library or of a living room may be decorated. The following articles were used in the arrangement:

Two Navajo rugs, one on the floor and one, representing a dance sandpainting, draped on the wall; several pieces of Pima and Pueblo pottery Papago baskets, a Hopi ceremonial robe, a Sioux Indian war bonnet, a collection of Pipestone ornaments and pipes, a tobacco pouch of porcupine quill embroidery, several pillows and ottomans covered with miniature Navajo rugs, a set of two Indian bows and arrows, and several pieces of furniture (bookcase, easy chair, sofa, tabouret, etc.,) made by the pupils of a nonreservation Indian school. On the lower shelf of the bookcase was a display of beadwork on articles used by the Indians of the plains,—a belt, moccasins, and camp bags.

Near the northwest corner of the pavilion, attached to one of the pillars of the building, was a standard with 20 wing frames, containing two pictures to each wing, illustrating the "4H Club Work" of the boys and girls of the Indian service whose activities in gardening, poultry raising, pig raising, sewing, cooking, canning and preserving, bettering of home conditions, etc., were set forth in detail; also the "Chapter Work" of the older people in agriculture. Old-time homes were contrasted with their present-day comfortable domiciles; a few picturesque Indian scenes gave glimpses of old-time tribal life, and views of the forestry, liquor suppression, probate, library, construction of schools and homes for Indians. Medical work for Indians and health activities completed the series of wings.

A few feet to the north of the pavilion a broad, low table was placed, on which were displayed 35 Navajo Indian rugs of variety of designs, highly colored and sombre, black and white combinations, ceremonial, chiefs' rugs, and lighter weight blankets, these being sent by weavers from different sections of the Navajo Indian reservations to

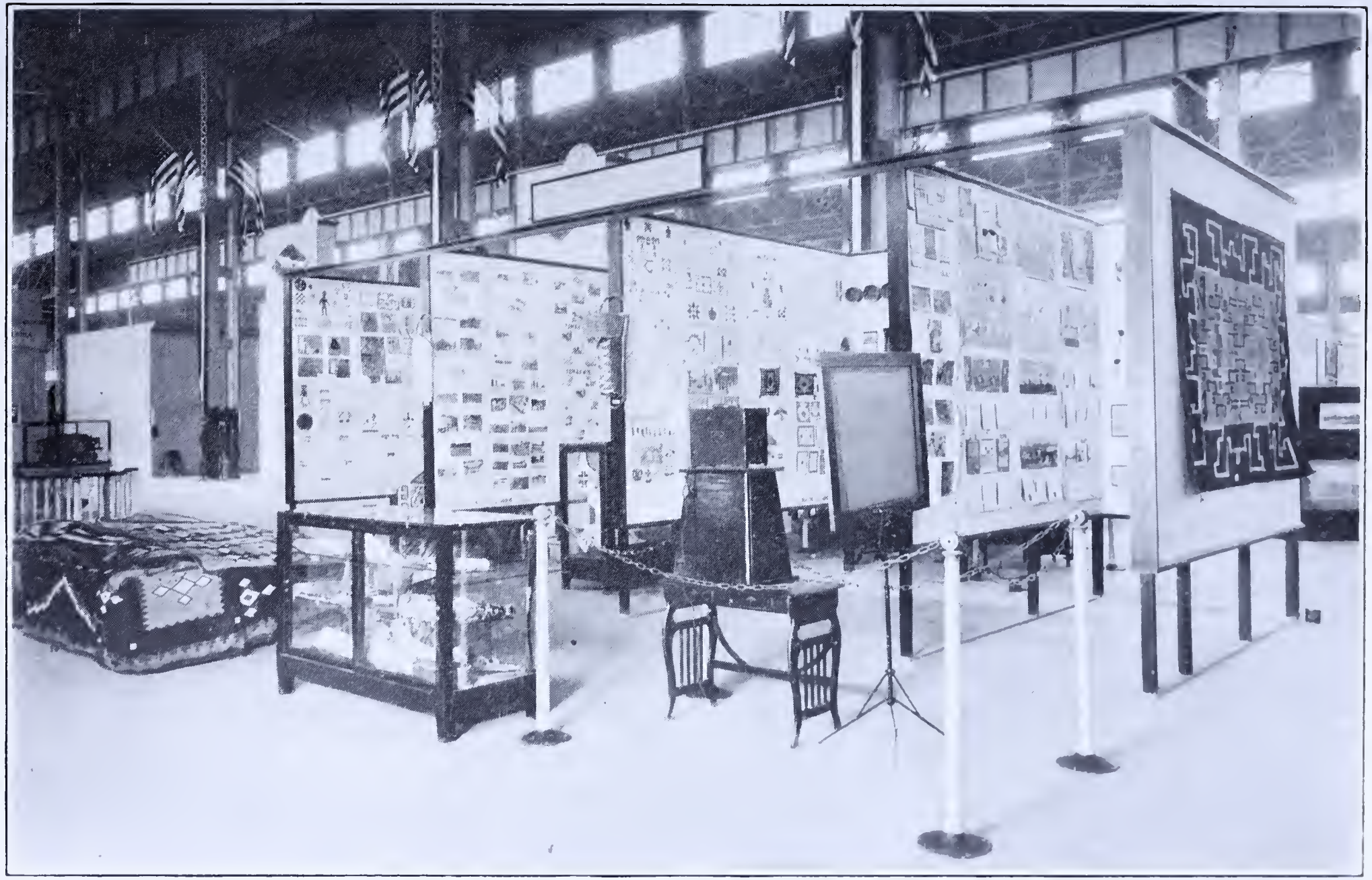

PLATE 133.—Booths illustrating work of Indian school children.

illustrate the work they so ably perform, and which makes them self-supporting.

Near the Navajo rug table were two large pictures which attracted a great deal of attention. One portrayed the activities of the American Indian in the World War, the other depicted the development of an Indian home from 1911 to 1921 by a series of three views, number 1 being a one room hut, number 2 a log house and number 3 a modern frame bungalow.

Along the northern side of the space occupied by the Indian Bureau was a series of four three-sided booths, opening to the south. On the sides of these booths, mounted on cardboard plats, were shown samples of the handiwork of the pupils of the Indian schools. (Plate 133).

The cards showing the academic work displayed samples of practically all of the written work of the schools, such as spelling, writing, mathematics, English, drafting, etc. Classroom work of all the grades was shown, also articles made in the domestic art departments of the schools.

The posters covering health instruction were illustrated with pictures and photographs giving concrete examples of the measures used to promote health; of the food consumed to build up strong bodies and wholesome minds.

The agricultural and athletic activities of the schools were set forth on the cards covering these subjects by photographs of pupils engaged in physical exercises; of school and adult gardens, poultry yards and houses; barns with cattle, sheep, pigs and other stock, and of farming activities, as conducted in the different sections of the country. Pictures of schools, day, boarding, and reservation, also nonreservation, set forth the different kinds of schools conducted by the U. S. Government for Indians.

The art instruction in Indian schools is colorful and unique, and the exhibit demonstrated how the Government is encouraging native designs in every way possible as decorations for napery, and household articles of every-day-use, such as lambrequins, table and dresser scarfs, draperies, and on personal clothing. Designs for baskets, blankets, and rugs were displayed, also drawings of the eagle dance and other ceremonials.

Specimens of classroom work, samples of vocational work, small looms, and a few dolls, crudely made by children of the Indian schools, were distributed to teachers and others interested in Indian education, to be used by them in disseminating information regarding the con-

PLATE 134.—Sand pit, showing cacti and other desert plants, with Indian silversmith and rug weaver at work.

THE SESQUICENTENNIAL NAVAJO RUG.

THE RUG WOVEN IN THE EXHIBIT OF THE U.S. DEPARTMENT OF INTERIOR, BUREAU OF INDIAN AFFAIRS, AT THE SESQUICENTENNIAL EXPOSITION IN PHILADELPHIA, IS THE WORK OF A NOTED NAVAJO WEAVER, AS TAH AL-UNTA NE BAH ENDITO (MRS. TIM JOHNSON), OF THE PUEBLO BONITO JURISDICTION OF THE NAVAJO INDIAN RESERVATION ON THE NEW MEXICAN SIDE.

AS TAH, WHO IS SAID TO BE THE FINEST WEAVER OF THE PUEBLO BONITO, AND HER HUSBAND, HOSTEEN NULSOS BEGAY, A NOTED INDIAN SILVERSMITH, WERE BROUGHT TO PHILADELPHIA FROM THE TOWN OF COOLIDGE, NEW MEXICO, EIGHTEEN MILES NORTHEAST OF GALLUP, TO FORM A PART OF THE INTERIOR DEPARTMENT EXHIBIT. DURING THE PERIOD OF THEIR STAY AT THE EXPOSITION, AS TAH WOVE ONLY THIS ONE RUG, DOING ALL THE WORK WITH HER OWN HANDS, FROM PREPARING THE RAW WOOL TO THE ACTUAL WEAVING OF THE RUG.

THE RUG HAS WOVEN INTO IT A STRONG MEDICINE DESIGN, WHICH INVOLVES WEAVING INTO THE WOOF AND WARP OF THE RUG, WITH EACH STITCH, THE MAGIC WISH OF THE SOUTHWEST LAND OF THE NAVAJO. THIS WISH CARRIES HEALTH AND SUCCESS FOR THE ULTIMATE OWNER OF THE RUG, AND IS A "MEDICINE" SO POTENT THAT IT NEVER FAILS.

OCTOBER 1926

PLATE 135.—Photograph of the rug woven at the Exposition by Indian rug weaver.

structive educational and vocational endeavors conducted by the Bureau of Indian Affairs for the Indians.

A unique feature of the Indian exhibit, which attracted great attention from the throng of visitors, was an actual demonstration of silversmith and rug-weaving work. (Plate 134). The Navajo silversmith, Hosteen Nulsos Begay (English name, Tim Johnson) and his wife, As-tah-bah, a skilled Navajo rug weaver, were seen plying their arts amid surroundings indicative of the desert land from which they came. In the southwest corner of the space allotted to the Indian Bureau, there was constructed a box-like enclosure about 12 feet square and 8 inches deep. This box was filled with sand and half of it planted with a collection of 15 varieties of cacti, from the southern part of Arizona. In the other half section of the enclosure, the silversmith and rug weaver were busily engaged, Tim fashioning from silver dollars many unique ornaments of jewelry and As-tah-bah producing a beautiful Navajo rug.

Tim's anvil was a piece of railroad iron, spiked down on a plank, and his crucible a clay bowl heated in a charcoal fire contained in a clay basin imbedded in the sand. Bracelets, rings, pins, watch fobs, pendants, spoons, and many other articles of beauty and utility grew in a truly magical way from plain American dollars or Mexican pesos under the skillful manipulation of the Indian artisan.

Tim and his wife gave two demonstrations, or periods of work, both morning and afternoon. Teachers of arts and crafts, public school supervisors of home economics and handicrafts, and those especially interested in weaving rugs and cloth made frequent visits to the "Desert" and remained at length to study the methods employed by the weaver whose small hands carried the many threads of the woof, through the warp, making the design. The pattern was in her mind, not on paper. She carded and spun her wool, and used only wool for both woof and warp of the blanket which slowly grew day by day into a thing of beauty and utility. (Plate 135).

An ancient Indian plow, over 150 years old, also stood in the "Desert," showing the manner of plowing long ago in contrast to the up-to-date methods of the present-day Indian farmer.

Directly in front of the east side of the central pavilion stood a large totem pole, carved from a tree by William Shelton, a Tulalip Indian artisan, of the State of Washington. The pole was 15 feet in height and over a foot in diameter, and was a fine example of an art which has been handed down from a far distant past.

There were five glass display cases, one of which stood in one of the school handiwork booths and contained a beautiful collection of

PLATE 136.—Examples of Sioux and Chippewa bead work, moccasins, baby carrier, gauntlets, camp bags, war bonnet, and beaded vest.

PLATE 137.—Examples of bead work, Navajo silverware, and various other Indian craftsmanship.

PLATE 138.—Bead work of Cheyenne, Arapaho, Cree, Rocky Boy and other tribes of Indians.

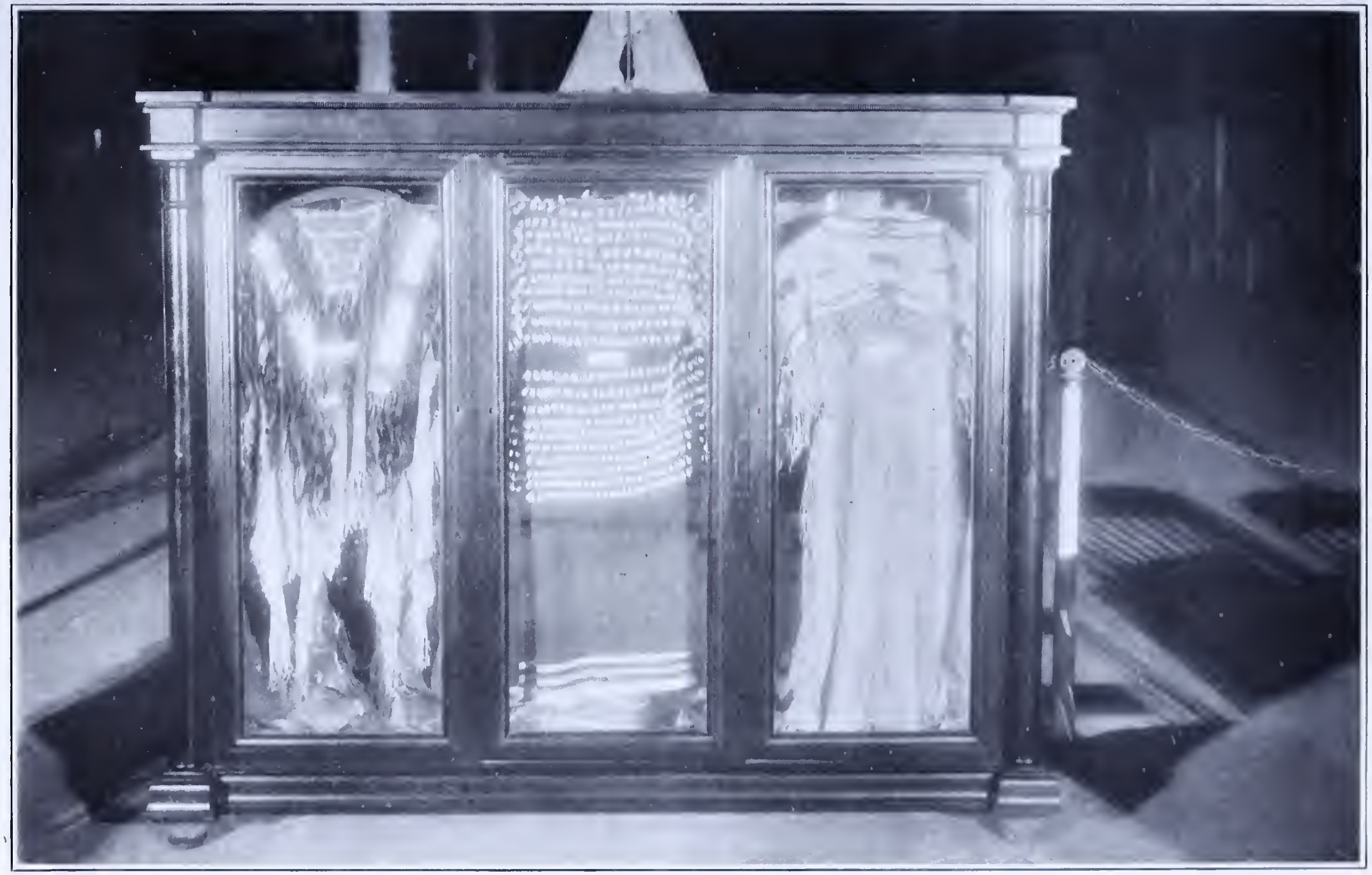

PLATE 139.—Native Indian dresses.

needle work after purely Indian designs. The collection included luncheon sets, table runners, ladies' bags, centerpieces and napkins. Another glass case was filled with examples of Sioux and Chippewa beadwork; moccasins, baby carriers, gauntlets, camp bags, a war bonnet, a beaded vest, and other articles, forming a splendid collection, which was much admired by the visiting public and appreciated by those familiar with this form of Indian art. (Plate 136).

In a third glass case was a collection of beadwork necklaces, hat bands and watch fobs made by Indian school children, and a display of Navajo silverware. (Plate 137). In this case was a very unique Sioux baby rattle, made of skunk jaws and deer toes, tied to a short stick covered with buckskin; a Sioux warrior's headdress; a Chippewa medicine man's bag of potent herbs; a magnificent camp bag of porcupine quill embroidery; several necklaces of wampum and shells; a string of turquoise beads; five Indian dolls; and a small Pima basket of unusually fine weave.

The fourth glass case was filled with beaded bags, purses, head bands, neck chains, and moccasins made by Cheyenne, Arapaho, Cree, Rocky Boy, and other tribes of Indians, also a collection of especially fine Pima and Mancopa pottery. (Plate 138).

The fifth case stood in the southwest corner of the exhibit, facing east, and contained a handsomely beaded buckskin shirt and leggings, trimmed with hair, and fringed, the type of clothing formerly worn by plains indians. By the side of the man's suit hung a woman's blue cloth ceremonial robe trimmed with Cowrie shells. A buckskin dancing robe, elaborately embroidered in blue and white beads, completed the display in this case. These costumes were the source of much interest to visitors. (Plate 139).

Two miniature moving-picture machines were in use, running two parts of a film showing Indian agricultural and school scenes, native arts and crafts, and visits of Indian delegations to Washington.

Bureau of Pensions

The primary object of the Pension Office exhibit was not to glorify the sword, but to proclaim the Nation's gratitude for the suffering and sacrifices of the gallant soldiers and sailors who, in times of storm and stress, cast their lives and fortunes on the altar of human freedom; to extol the patriotism which has successfully contended against forces hostile to American institutions; to promote public appreciation of heroes who stood for or fell in defense of the principle that "government of the people, by the people, for the people, shall not perish from the earth."

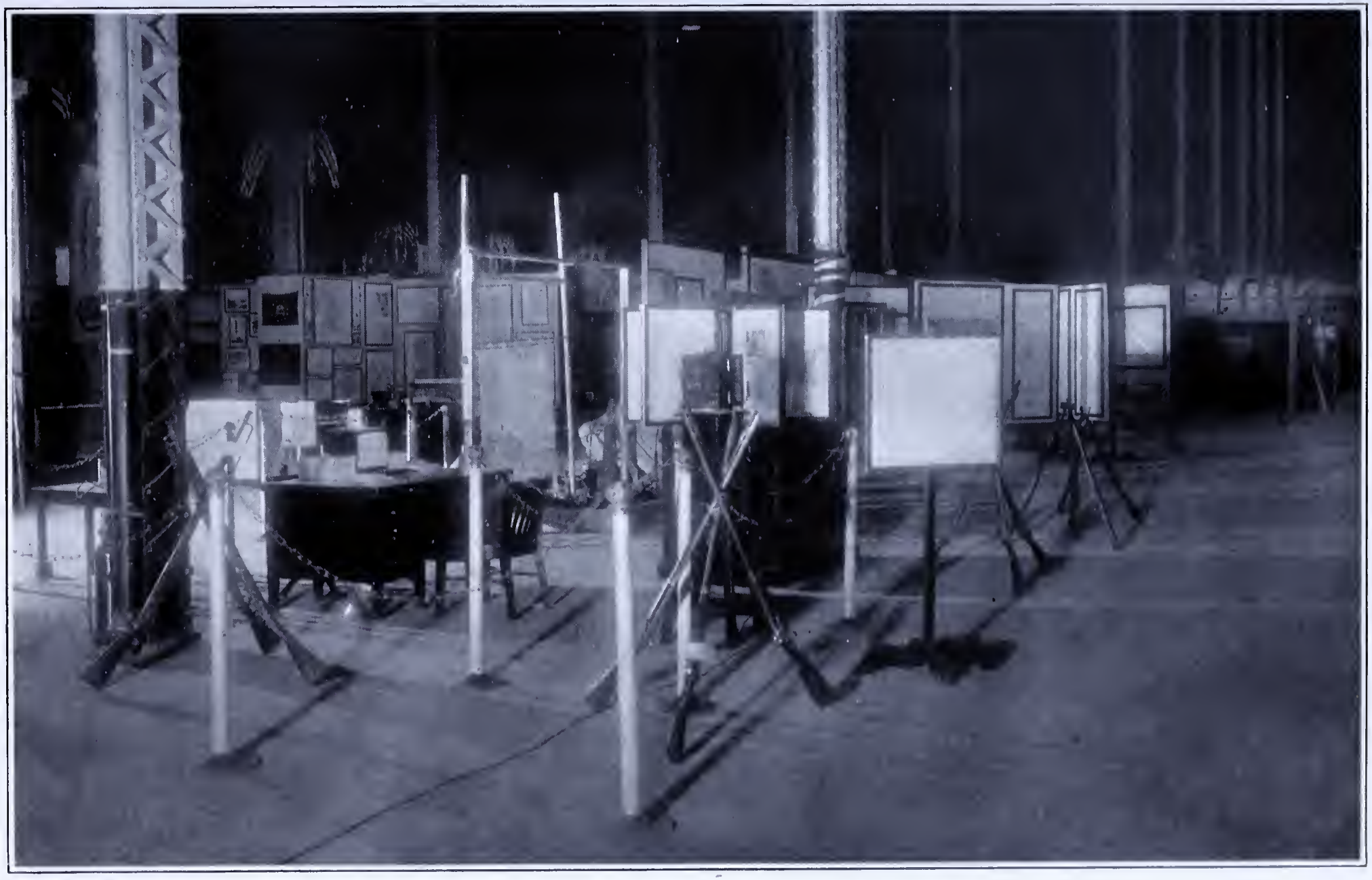

PLATE 140.—General view of Bureau of Pensions exhibit.

Wing-frame exhibit.—In a 68-unit wing-frame case were exhibited valuable historical documents from the archives of the Pension Office; pictures of surviving widow pensioners of the War of 1812 and their homes; a number of pictorial charts illustrating the important steps in the settlement of pension claims; and a gallery of rogues who are wont to prey upon unsuspecting pensioners. (Plate 140).

The Westward Trail.—Every stroke of the hour tolls the knell of five pensioners. Their passing was symbolized in the hourglass design featured in this exhibit, which showed that Daniel F. Bakeman, the last survivor of the War of the Revolution (1775-1783), died in 1869, aged 109 years; that the last widow pensioner of the Revolution, Esther S. Damon, died in 1906, at the age of 92,—135 years after the signing of the Declaration of Independence; that Hiram Cronk, last survivor of the War of 1812 (1812-1815), died in 1905, aged 105 years; that, of the 20 surviving widows of the War of 1812, Mahala Huff, hale and hearty at 107, is the senior; that but nine survivors of the Mexican War (1846-1848) are on the pension roll, the oldest being Amasa Clark, aged 101; that more than a thousand Mexican War widows are yet pensioned.

As to the Civil War (1861-1866), in which more than two million "Boys in Blue" responded to the call of duty, it was pointed out that, after a lapse of 60 years, scarcely 100,000 of them survive, at the average age of 83; that approximately 225,000 Civil War widows are on the roll.

Touching the War with Spain, including the Philippine Insurrection and Chinese Boxer Rebellion (1898-1902), it was shown that the rolls embrace in round numbers 125,000 survivors and 21,000 widows and dependents.

As to the World War (1917-1921), it was noted that 49 veterans and 21 widows, enrolled before the Veterans' Bureau was given exclusive jurisdiction in such cases, are in receipt of pension.

Relative to the Indian Wars (1817-1891), it was shown that the roll includes 4,000 survivors and 3,000 widows.

As to the Regular Establishment, the fact was indicated that the roll of pensioners comprises 13,000 veterans and 4,000 widows and dependents.

To many these statistics were merely statistics. To the visitors with imagination or a bent for figures this feature of the exhibit afforded interesting diversion and wholesome food for thought.

Automatic projector.—Another feature of the exhibit was an automatic filmograph presenting, in addition to information of general interest concerning pension activities from the period of the Revolution

down to date, pictures of famous warriors, martial scenes, and aged pensioners, the latter group including widows of the Old Wars, survivors of the Mexican War, and the three living mothers of Civil War soldiers.

Visitors to the exposition were thus permitted to visualize interesting pensioners in their accustomed environment, enjoying life in comfortable homes, made possible through the generosity of a grateful people.

Not the least engaging of the foregoing films were those depicting the Washington Monument and the Lincoln Memorial, splendid tributes of national patriotism. Here were views of Arlington, the great national cemetery, bivouac of the heroic dead. In this series were shown the Maine Memorial, the guarded tomb of America's unknown warrior, and the stone under which, in one vast sepulcher, lie the remains of 2,111 unidentified soldiers gathered from the fields on which they fell. Here also was pictured a vista in the wooded landscape uniformly dappled with headstones marking the graves of comrades who marched, fought, died, and now rest, shoulder to shoulder.

Decoration.—Decorative features comprised stacks of rifles and accoutrements of the types used in the War of the Revolution, the Mexican War, the Civil War, the War with Spain, and the World War, respectively—emblematic of untold sacrifice and the spirit of America.

Bureau of Education

The exhibit of the Bureau of Education illustrated its function as an agency for the distribution of information, by which educational achievements in any part of the country are brought to the attention of schoolmen all over the land; and to set forth its activities in behalf of the natives of Alaska.

Much of the most important work of the bureau can not be adequately illustrated objectively.

A limited collection of documents, for example, was exhibited to typify the whole work of investigation and publication and the results.

A colored chart described the organization of the bureau and the distribution of its work among the several divisions.

A map showed the kind and location of the surveys made by the Bureau of Education.

A map of Massachusetts set forth the principal recommendations of the bureau after a survey of technical and higher education in that State, specifically with respect to the location of 12 junior colleges.

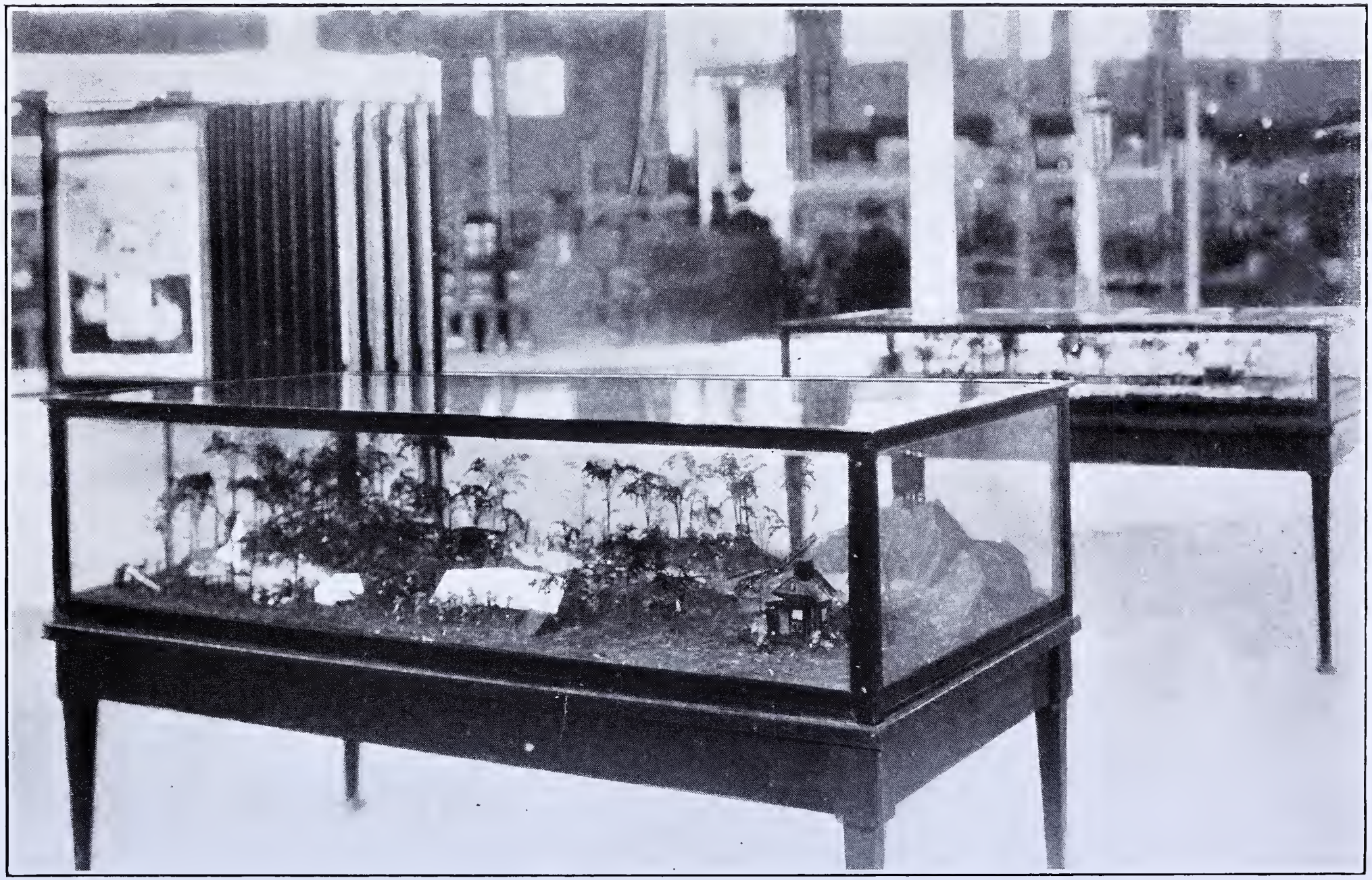

PLATE 141.—State Park model, made by school children of Washington, D. C.

A moving model showed the average number of children out of each 100 entering the elementary grades who continue through high school and through college.

Rural education.—Three charts exhibited improved types of State and county organization which make adequate support and professional management of schools possible in rural communities. The improvement of rural schools is conditioned by the type of administrative organization in vogue.

Two maps and a number of pictures of school buildings showed how the schools of one county were reorganized on the 6-3-3 plan. Small one-room schools were abandoned; replaced by new consolidated schools of modern type as to architecture, equipment, placing, upkeep of grounds, etc. The maps showed the location of buildings under the old and the new situations.

A model of a good one-teacher school from Delaware was displayed. Information on plans and cost of building and equipment were available, in order that those who sought to improve the schools of their communities might profit by the exhibit.

Studies in modern life and the elements of social science.—Two building projects by children in the fifth grade represented the work in curriculum reconstruction for elementary schools in which the bureau is engaged.

Transportation was the central subject of one of the exhibits. It represented highway construction and the utility of various types of surface found on our public roads, together with the best methods of roadside improvement and parkway construction.

Outdoor recreation and the conservation of forest life was the subject of the second exhibit. It represented a typical State park and the various forms of outdoor recreation which these parks afford together with the forest and different forms of flora and fauna which find refuge there. (Plate 141).

Home economics.—Twenty-four charts in a wing-frame demonstrated the progress made in home economics education with respect to nursery school facilities provided for child care and training in home economics departments in colleges and universities; care of children in household management houses; modernly equipped foods and clothing laboratories; methods employed in teaching food facts to elementary and junior high school children; and home economics subject matter taught to boys in the senior high school.

Alaska.—The Bureau's work in Alaska lends itself to successful exhibition. A scenic panorama, 8 by 12 feet, showed a typical reindeer herd grazing in an untimbered valley of northern Alaska. The

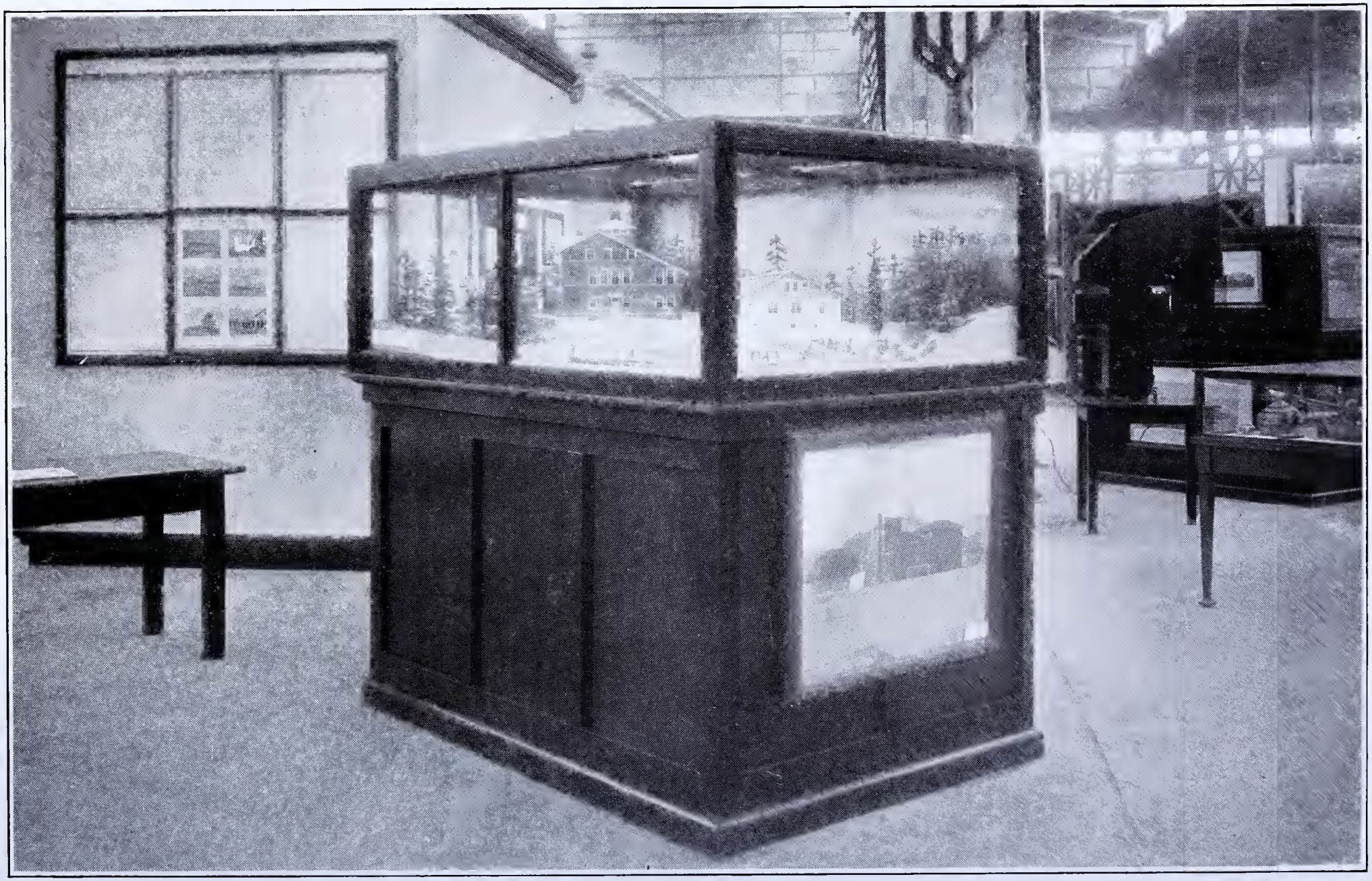

PLATE 142.—Model of Hydaburg School, Alaska.

PLATE 113.—General view Geological Survey exhibit, east side, showing inside of colonnade.

500,000 reindeer are distributed in similar herds along the entire coastal regions of western Alaska.

Upon a large map of Alaska the locations of the schools, hospitals, and the centers of the reindeer industry were indicated.

A large case contained material illustrating the work done in the schools, including carpentry, sewing, embroidery, drawing, writing, carving in wood and ivory, and basketry.

Groups of pictures and statistical charts showed the nature and the scope of the school, medical, and reindeer services.

A few years ago, the inhabitants of two villages in southeastern Alaska, not advantageously located, migrated to an uninhabited tract upon one of the large islands, selected for them by the bureau. These people, only a generation removed from savagery, have turned the dense forest into a thriving, well laid out, electrically lighted, self-governing town, with several miles of planked streets, a modern dock, a saw mill, a cannery building, church, prosperous cooperative store, and lumber yard. A model showed the attractive school building and teachers' home in this village, which the natives have named Hydaburg. (Plate 142).

Geological Survey

At present the Geological Survey is organized with five branches which handle the major functions—geologic, topographic, water resources, conservation, and Alaskan branches—all of which were represented in the Sesquicentennial exhibits. The work of the survey as a whole, or even within any one branch, is so diversified and specialized that it is manifestly not feasible in a limited exhibit to demonstrate in detail all the methods and results. The effort, therefore, was directed to selecting material that would illustrate some high-light or characteristic feature of each type.

Geologic Branch.—The work of the Geologic Branch is very broad because the science of geology itself is very broad and diversified. (Plate 143). The three-score geologists of the branch are essentially specialists in particular lines of geology, for the work of such sections as those of paleontology, or volcanology, or the geology of fuels—petroleum, coal, and oil shale—or the geology of metals or of potash and nitrates are so divergent as to require men of widely different training and experience.

In the central screens one alcove was given to geology. On these screens glacial geology was represented by a large relief map of the United States on which was shown in colors the areas covered by the successive ice sheets; paleontology was indicated by the photograph of

PLATE 144.—Coal resources.

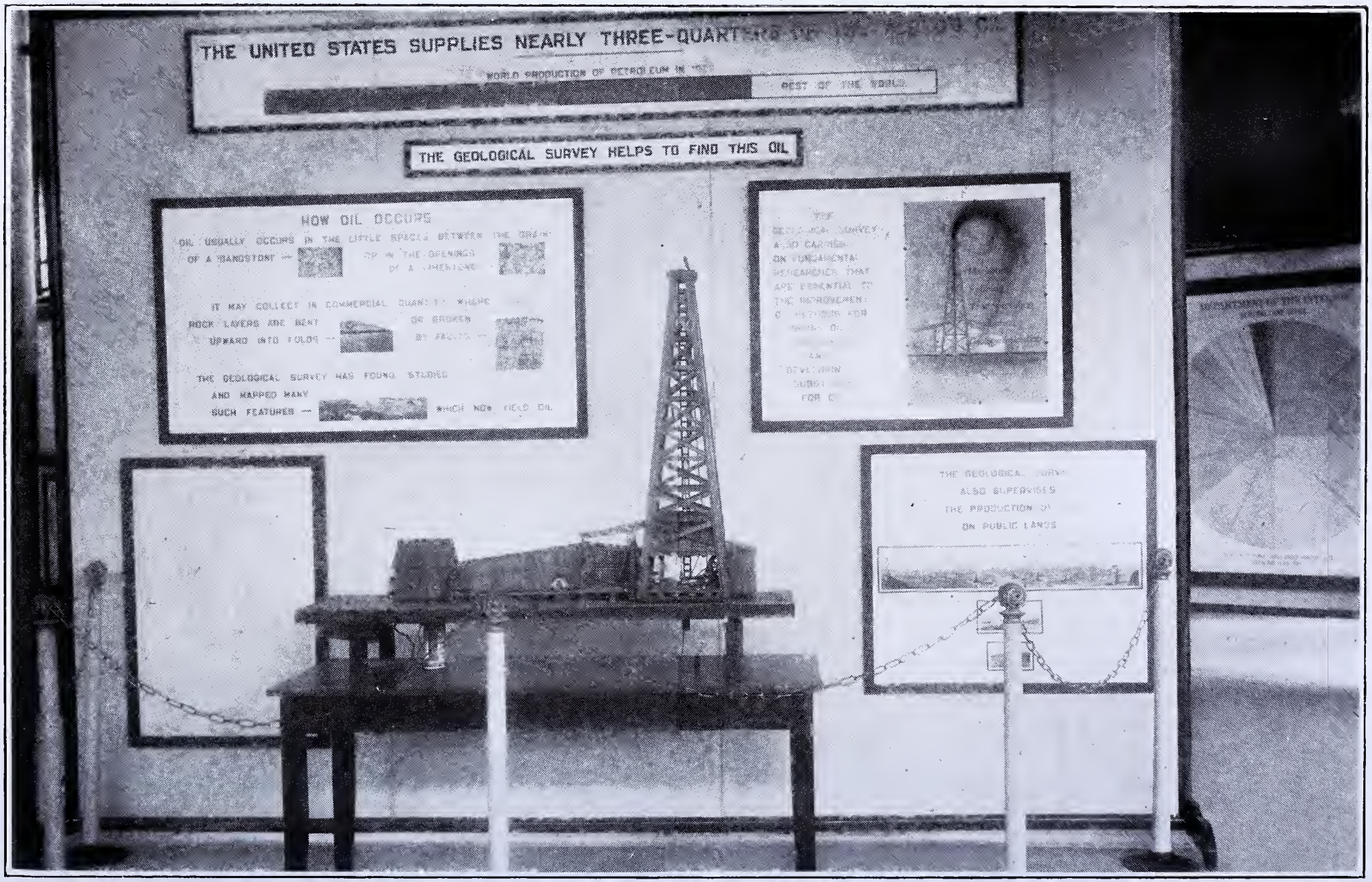

PLATE 145.—Oil resources.

a large fossil palm leaf and the restoration of a dinosaur; stratigraphy and areal and structural geology were represented by two colored maps of the central Black Hills area, by a geologist's field sheet, by the photograph of a geologist pointing out the contact between two formations, and by a diagram showing the development of an overthrust fault. Three photographs showed scenes in the chemical, physical, and petrographic laboratories. A chart explaining the causes and effects of the Montana earthquake of 1925 illustrated the work in dynamical geology, and two charts on the evolution of Yosemite Valley, California, and two sets of views in the Mammoth Cave region of Virginia showed several phases of physiography and historical geology.

Coal and petroleum were given separate exhibits at one end of the Geological Survey space. Coal was represented by a large wall map of the United States showing the areas underlain by deposits; below was a glass case inclosing specimens of the different types of coal. (Plate 144). On the adjoining screen were several charts setting forth the importance of America's oil industry, the way in which oil occurs, and the part played by the Geological Survey in its discovery and production; in front of this screen was a large wooden model of an oil derrick complete in every detail. (Plate 145).

Investigations of the country's mineral resources—metals and nonmetals—were illustrated by material in three glass cases. One of these contained specimens selected for their striking appearance; the second included samples of minerals found in the search for potash in the United States; and a small field distilling apparatus used for testing oil shale, together with a specimen of the shale. The third case bore a sign "your house—and the minerals that make it;" inclosed was a model house, and about 70 mineral specimens labeled with their names, localities, and their uses in building and equipping a home.

Topographic branch.—A topographic map showed not only the location of natural features and the works of man, but also the actual contour of the land surface and the approximate altitude of every point above sea level. Such a map is of great use and value in many ways and to many people, especially to engineers. The principal task of the Topographic Branch is the preparation of such a map of the United States, divided into convenient-sized sheets. Part of the exhibit of the branch showed examples of its finished products—nine standard topographic sheets of varying types of country, two sheets with shaded relief added, a sheet of river survey in plan and profile, a sheet of the United States portion of the International Map of the World, and other subjects. The rest of the branch's exhibit depicted the development of airplane photography and its application to topographic mapping. The central feature of this display was a large photograph

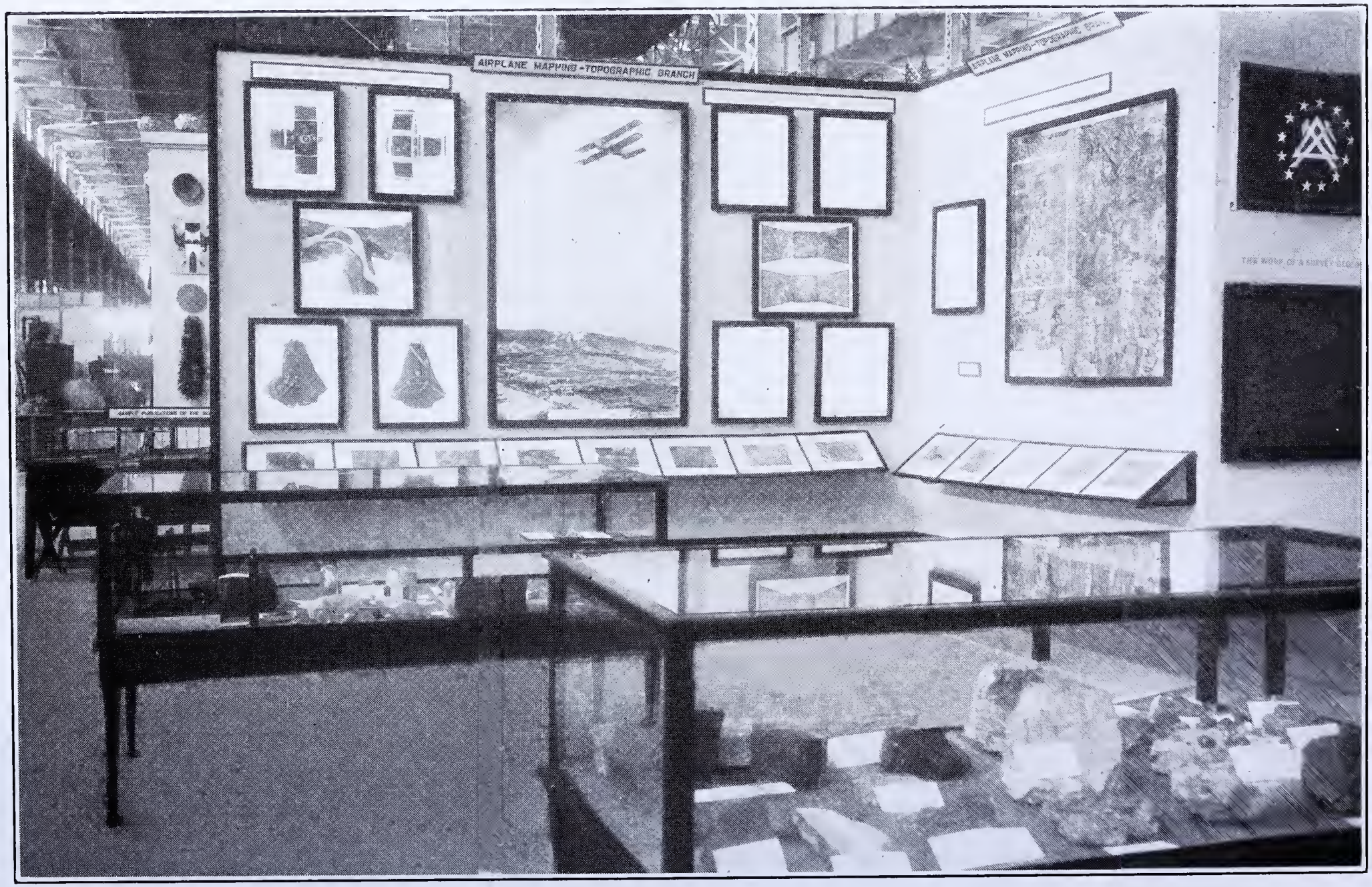

PLATE 146.—Airplane mapping.

PLATE 147.—Map engraver at work.

of a Western landscape, over which flew an airplane; from the plane were drawn rays that showed the area on the ground which is included in a single exposure. (Plate 146). Grouped around this were photographs of the camera used in the work, sample views taken with such a camera, a mosaic of the Los Angeles district composed of airplane photographs, and a corresponding map.

Water-resources branch.—The exhibit of the Water Resources Branch was chiefly confined to its stream-gaging work. This was illustrated by a number of colored enlargements, and by a water stage recorder displayed in a glass case.

Conservation branch.—The exhibit of the Conservation Branch included a number of enlarged photographs of typical activities on Government lands—grazing, power plants, and the mining of coal and petroleum, salt, phosphate, etc.; two diagrams illustrating the output of coal and petroleum from the public domain in 6 years; a map and diagram of a power project in Oregon; and a colored map showing the agricultural utility of a certain area.

Alaskan branch.—The exhibit of the Alaskan branch consisted of a large map of the coal deposits contiguous to the Alaska Railroad; a geologic map of a metalliferous area typical of those prepared by the branch; an index map of the areas for which topographic maps have been made; a map showing the areas covered by perpetual ice and snow —which, contrary to the general belief, is only 3 per cent of Alaska— and a number of views of placer mining and typical landscapes.

Division of Engraving and Printing.—The large map reproduction plant of the Geological Survey engraves or photolithographs and prints all the Survey's topographic maps, geologic folios, and special maps, and also does a large volume of similar work for other Government and cooperating agencies. The high standards of its work are recognized all over the world. Samples of its output were scattered through the entire exhibit of the survey, but a small special exhibit illustrated one phase of its work. An engraver actually cutting a copper plate for a topographic map was the central feature; beside him, in two glass cases, were shown the stages in the reproduction of such a map. (Plate 147). Three copper plates—one for the works of man, to be printed in black; one for contours (lines to show the shape of the land surface), to be printed in brown; and one for water features, to be printed in blue—flanked by corresponding prints in the separate colors, occupied one case. The second case contained three lithographic stones, on each of which the design had been transferred from one of the copper plates; these also were flanked by their corresponding single-color prints, and the exhibit was rounded out by a sample of the completed map, in which the black, blue, and brown were combined.

PLATE 148.—Grand Canyon Survey boat.

Special Exhibits

Sample publications.—Chained to a specially constructed table were displayed a number of bound copies of typical publications of the Geological Survey—professional papers, bulletins, and water-supply papers—and a complete list of all publications.

Grand Canyon survey.—Half a century ago Major John Wesley Powell, who later became the second Director of the Geological Survey, made the first trip through the canyons of Colorado River—a daring venture into the unknown. In recent years the Geological Survey has made a complete and accurate survey of the Colorado and its principal tributaries—topographic, geologic, and hydrologic—with the particular purpose of locating all practical dam sites as a basis for power development and flood control. The "Grand Canyon" portion was surveyed in a hazardous expedition in 1923. One of the four open boats used by the party was on display; over it, back to back, were two huge enlarged photographs of scenes of the trip, and a third hung on a nearby wall. (Plate 148).

"The Winning of the West."—A pair of large relief models, with indirect lighting, portrayed methods of field work and the share played by the Geological Survey in the winning of the West. The views were of a Western valley. The one, in its aspect of half a century ago, depicted the investigations by survey geologists and engineers; the other, the valley as it would appear today, illustrated "home-making and the development of resources" that have been influenced and helped by the early investigations.

Colonnade and photographic enlargements.—The outer side of the Geological Survey's exhibit, on a main aisle, was marked by a colonnade; on this were mounted eight of the huge enlarged photographs, each 4 by 8 feet, which not only illustrated various phases of the survey's field work but also showed the skill of the photographic laboratory's staff.

Bureau of Reclamation

The exhibit of the Bureau of Reclamation illustrated the work which the Federal Government is doing in reclaiming by irrigation arid and semi-arid lands in the seventeen States west of the 100th meridian, and in affording to thousands of otherwise landless men opportunities for acquiring a farm home on long time payments without interest.

Model of irrigated farm.—The central feature of the Bureau's exhibit was a 9 x 7 foot model, constructed accurately to scale, of a 40-acre irrigated farm. Here were shown the main canal, the gates admitting a stream of water into the main lateral, and turnouts

permitting the flow of water to the farm laterals and finally to the farmer's growing crops. This was a model of the home of a prosperous settler on one of Uncle Sam's irrigation projects—a graphic presentation of what thrift and good farming can accomplish under irrigation in the arid region.

Oil paintings.—The background of the Bureau's exhibit was a series of 19 oil paintings, supplemented with charts and maps. The paintings, in two sizes, 20 by 24 inches and 30 by 40 inches, showed progressively the transformation wrought by irrigation, from the desert to the completed farm home. Here were shown several of the huge storage and diversion dams constructed by the Bureau, beautiful Jackson Lake reservoir, a main canal carrying a small river of water, the desert in all its lonely grandeur and mystery, the farmer with long-handled shovel guiding a stream of water on his land, and the humble home and first crop of an early pioneer. Other paintings depicted the wide variety of the crops grown on the projects. Here were alfalfa and wheat from the northern projects contrasted with the cotton and grapefruit of the Southwest. The eye of the visitor was held involuntarily by the lifelike views of purebred Holstein cattle, thoroughbred sheep, and pedigreed chickens. All these scenes were typical of what can be found on any of the more advanced projects of the Bureau.

Wall maps.—One of the large wall maps showed the location of the 24 projects already under construction and the 6 new projects authorized by Congress. The other represented the Colorado River Basin and the location of the proposed Boulder Canyon dam, the construction of which is under consideration by Congress. If this great project is approved, a giant dam 550 feet high will rise in the narrow canyon of the Colorado providing stored water for the irrigation of millions of acres of land in the Lower Colorado River Basin, protecting the lower reaches from devastating floods, and furnishing power to turn the wheels of industry in nearby communities.

Chart.—A large colored chart showed in diagramatic form the relative areas devoted to the principal crops on the projects in 1925 and their relative values.

Structural diagrams.—Interesting chiefly to the engineer were the structural diagrams of several of the principal dams constructed by the Bureau.

As a whole the exhibit told the story of reclamation by the Federal Government from the raw and arid land, through the work of construction, to the completed farm home,—a vivid and compelling story of the magic of irrigation and the fulfillment of the prophecy of Isaiah that the desert shall bloom as a rose.

PLATE 149.—Illuminated map showing "Our National Parks."

National Park Service

The exhibit of the National Park Service called attention to some of the most spectacular and unique of the natural phenomena contained in our national parks, and to emphasize the educational, conservational, and recreational uses which these reservations serve.

Model panoramas.—The main feature of the service's exhibit at the Sesquicentennial consisted of three model panoramas, viewed through windows in separate alcoves. All of the panoramas were 15 feet high. The central one, that of the Grand Canyon, was 30 feet in width, and the other two, of Yellowstone's Old Faithful Geyser and Hawaii's Lake of Fire, were 20 feet each. The Grand Canyon Model was a lifelike reproduction of this most remarkable work of stream erosion. Coloring and formation were reproduced with striking results, and several species of desert plants shipped from the Grand Canyon for this purpose, added to the realistic effect. By means of red, white, and blue electric lights, worked automatically from an electric switchboard, sunrise, midday, and sunset effects were produced.

On the left of this model was a reproduction of the Lake of Everlasting Fire that bubbles and boils in the crater of Kilauea, one of the living volcanoes in the Hawaii National Park. The imitation lava in the model crater bubbled and broke, with flashes of realistic fire bursting through, just as it does in Halemaumau, the crater of Kilauea.

To the right of the Grand Canyon was the model of the Old Faithful Geyser, showing the cone of the geyser tossing water up into the air every two minutes.

The mechanical end of the exhibit such as regulating the water in the geyser and making the fiery lake of lava, was worked out in the scientific laboratories of the Department of the Interior after considerable experimentation.

Pictures.—On the walls of the alcoves from which these reproductions were viewed hung 35 interesting colored replicas of national park scenes, approximately 30 by 40 inches in size. Thirty of these were enlargements of interesting airplane pictures taken by members of the United States Army Air Service. Each of the major national parks was represented in this collection by views of its most outstanding scenic feature.

Wall map.—On the outer wall of one end of the service exhibit hung a large map, 7 x 11 feet in size, on which the national parks were graphically indicated by openings covered with red isinglass. (Plate 149). Electric lights flashing on and off behind the map drew interested attention to the parks and their location. Connecting motor roads between the parks were particularly emphasized.

Setting.—The national park exhibit was indicated and set off by a rustic decoration across the front of the alcoves, which was decorated with the heads of animals indigenous to the parks and with cones of the sugar pine trees from Yosemite National Park, some of them 10 or 12 inches in length.

Postcards and literature.—In connection with the service exhibit postcards showing a camping scene in Yosemite National Park and mentioning briefly the outstanding exhibits of the national park system were distributed. Five thousand copies of the publications entitled "Glimpses of our National Parks" and 1,500 copies of "Glimpses of our National Monuments" were distributed to visitors who manifested an unusual interest in the park exhibit.

The Alaska Railroad

The exhibit of the Alaska Railroad is designed to show transportation facilities in the Territory of Alaska, particularly the transportation facilities owned and operated by the United States Government. The scenic wonders of the territory traversed by the Railroad are also shown.

Panorama of the Loop District.—The panorama of the Loop District between miles 49 and 52 shows one of the engineering features of the Railroad. At this point, as viewed from Dead Man's Glacier, the Railroad forms a perfect figure 9. The panorama is viewed from a window in a log cabin. Within the cabin is hung the bear rug as a representative of the big game hunting in the Territory. A gold pan of the type used in placer mining is also in one corner of the cabin.

Transportation Map of Alaska.—On a wing wall to the right of the panorama is hung a large map of Alaska showing the steamship routes from Seattle, Washington, to points in Alaska. The map also indicates the routes of the Copper River and Northwestern Railroad and the White Pass and Yukon, also the steamboat service on the Yukon River offered by the Alaska Railroad and the White Pass and Yukon River.

Colored Photographic Enlargements.—The photographic exhibit consists of eight photographic enlargements showing the scenic beauties along the Alaska Railroad, also the type of commercial steamer used in Alaska traffic and a view of one of the successful farms in the Territory. Possibly the outstanding feature of the photographic exhibit is the picture of Mount McKinley, which rises to an elevation of 20,300 feet.

THE DEPARTMENT OF AGRICULTURE

THE DEPARTMENT OF AGRICULTURE

Foreword

It is a poor exhibit that fails to teach more than the printed page. We learn from books what others know, but from a good exhibit we may gain knowledge that is all our own. It is by seeing the thing itself we learn the story it teaches, and facts thus acquired stay with us long after the printed page has faded from our memory.

Those charged with the construction of the vast assemblage of exhibits shown by the United States Department of Agriculture were manifestly familiar with this principle. It was evident throughout all of the Department's eighteen bureaus and offices, where were hundreds of exhibits that told their several stories with a clearness that gave the entire display remarkable interest. There was sufficient variety in the installations to make the general effect a pleasing one, while the orderly arrangement of the exhibits as well as the selection of those things that people want most to know about, did much to secure and hold attention. There were always visitors gathered about the vivid bird paintings and remarkable life-like animal groups that illustrated the conservation, control and utilization of wild life, as well as about the artistic scenes that in realistic settings told the story of the American Forest—the feature exhibit of the Department, unrivalled in beauty of execution and clearness of purpose.

American agriculture has wrought from a vast unbroken wilderness, a country covered with farms now supplying nearly every material need to a population of one hundred and seventeen millions. How this has been accomplished and the part the United States Department of Agriculture has taken in the matter, is the story told by its splendid exhibit.

Exhibits of the Department of Agriculture at the Sesquicentennial Exposition 1926

Introduction

The exhibit made by the Department of Agriculture was a comprehensive visualization of what the United States Government has done and is doing for the promotion of agricultural science and its application in industry. (Plate 159). The leading purpose of the exhibit was to illustrate the developments that have taken place in American agriculture during the one hundred and fifty years of our national independence.

The subjects embraced in this exhibit covered a wide and varied field, and the manner of their presentation was designed to clearly bring out their full purpose and instructive value. All these subjects have been brought together, classified by bureaus and offices and described and illustrated in this report.

With only about three months available for the preparation of the exhibit, the Secretary of Agriculture declared the project an emergency and directed that all the facilities of the Department be made available as needed to complete the work on time. An organization for planning and directing the preparation of the exhibits was created, consisting of not more than three persons from each bureau, to work under the bureau organization with the Department's Office of Exhibits, that acted as the coordinating agency and conducted the exhibition.

Work was begun on March 28, 1926, and 196 persons were engaged in the planning, designing and construction of exhibits. There were over six carloads of exhibits aggregating 102,600 pounds shipped to Philadelphia. Sixty-seven persons were employed in the installation which occupied a period of 17 days. An average of 7 persons were kept on duty during the exposition for demonstrating the exhibits.

The following Bureaus and Offices had exhibits:

Bureau of Agricultural Economics
Bureau of Animal Industry
Bureau of Biological Survey
Bureau of Chemistry
Bureau of Dairy Industry
Bureau of Entomology
Bureau of Home Economics
Bureau of Plant Industry
Bureau of Public Roads
Bureau of Soils
Extension Service
Office of Experiment Stations
Office of Information
Federal Horticultural Board
Fixed Nitrogen Research Laboratory
Forest Service
Insecticide and Fungicide Board
Weather Bureau

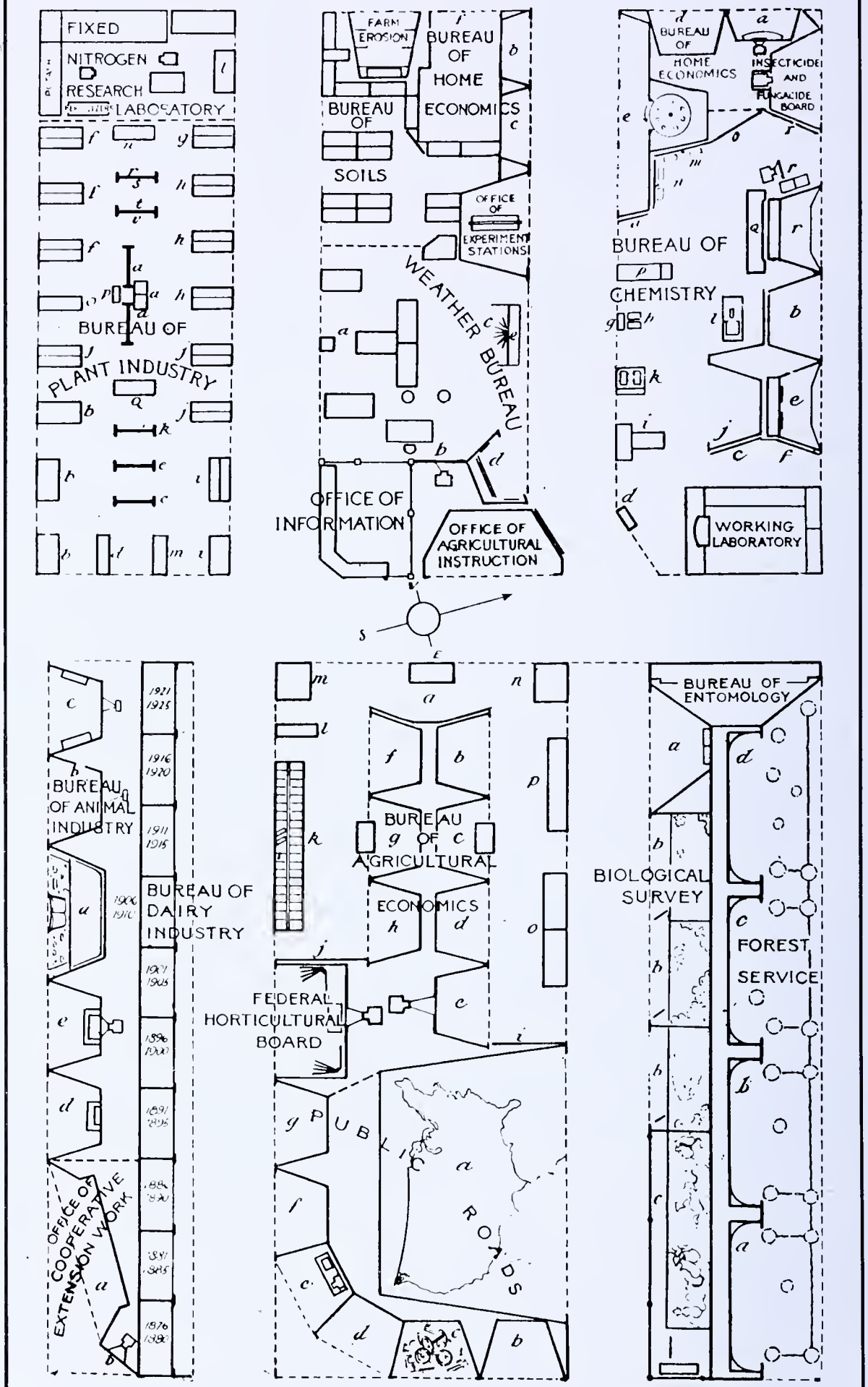

PLATE 159.—Floor Plan, Department of Agriculture Exhibit.

Description of the Exhibits

Bureau of Agricultural Economics

The exhibit of the Bureau of Agricultural Economics consisted of seventeen units of which eight were presentations of the Standardization of Farm Products, Crop and Livestock Estimates, Farm Management studies, Rural Life studies, Agricultural History Statistics, Cooperative Marketing, Land Economics, Warehousing and Farm Credit, and Market News. The presentation of the various subjects was by means of lettered panels illustrated by enlarged and colored photographs, and by charts and maps.

The *Crop Estimates* booth had a center panel, an allegorical picture of the Crop Reporting Board. This was an oil painting of a tree whose roots penetrated to all parts of the United States and upon whose branches were the fruits of the labors of the Board, namely, the various reports which are issued. One of the side panels was a Farmers' Almanac showing the principal reports for each month in the year, together with pithy sayings in Poor Richard style, describing some of the activities of the farm for each month. The other panel by means of text and colored photographs, showed the Crop Reporting Board at work and some of the outstanding features of crop reporting.

In the foreground of the Crop Estimates booth were shown the *Official Grain Standards* of the United States in small glass covered trays, each containing graded grain samples and other material affecting the visible grade.

The *Farm Management* booth contained graphic presentations of the change of agricultural practice upon an eastern Pennsylvania farm at three periods of its history—1800, 1860, and 1926. A plat of the farm showing the various crops in each of the three periods was the main feature of this exhibit. Lists of the commodities marketed in each of the three periods, together with pictures of the prevailing methods of transportation used in getting the commodities to market, gave the exhibit a very natural setting. The printed matter on the panels named the kind of crops grown during the periods presented, and important facts concerning the management of the farm.

The *Rural Life* booth contained graphs, charts and colored photographic enlargements, describing the various phases of rural social activities. The charts, under the heading "Facts About Farm Standards of Living," showed in graphic way some pertinent figures regarding the cost of a year's clothing for farm families and the distribution of money spent in farm homes and the relative importance of things furnished by the farm and purchased on the outside. These figures were necessary to an intelligent study of farm problems. A model of a com-

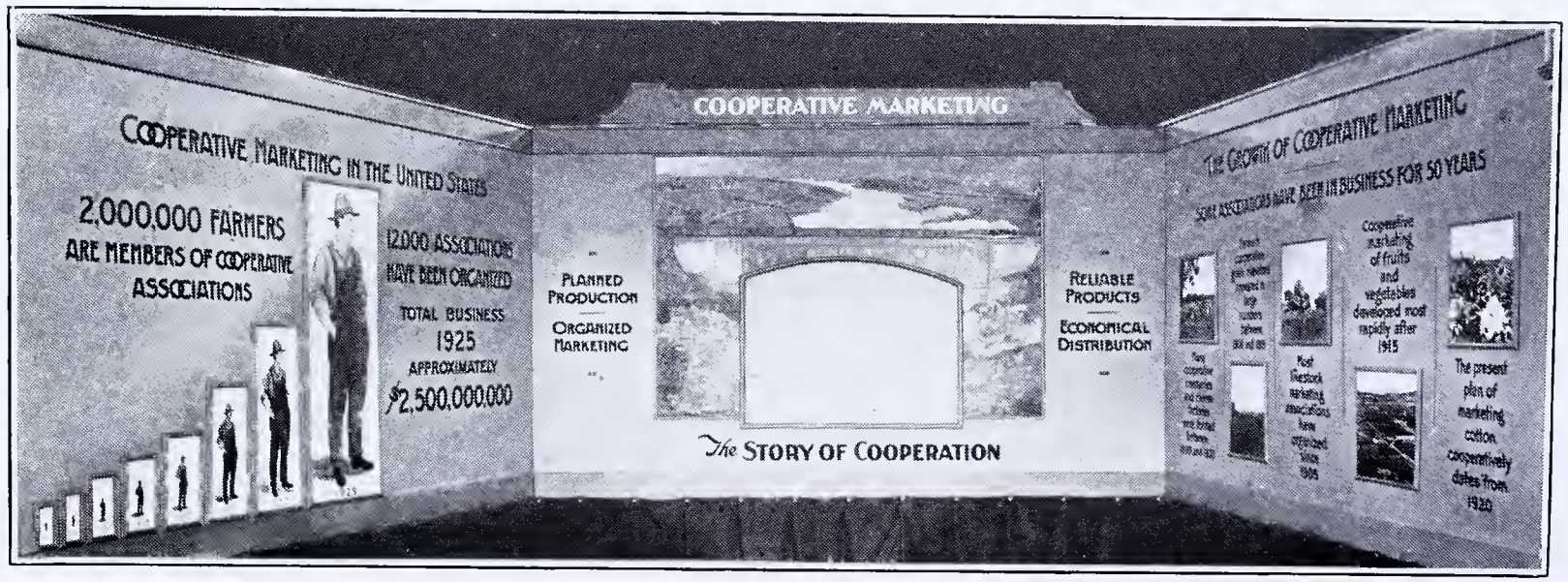

PLATE 160.—The Cooperative Marketing Booth illustrated outstanding facts regarding cooperative marketing in the United States.

PLATE 161.—The Land Economics Booth showed some of the aspects of farm tenancy, land values, and situation in the United States in regard to hired farm labor.

munity house which was described on one of the panels, was a feature of the exhibit. The community house was complete in every detail, even to the electric lighting and arrangement of stage scenery shown in the tiny auditorium.

Agricultural History was shown by a series of maps depicting the growth in volume and the expansion area of the principal farm crops and livestock from 1839 and 1840 to 1920. This series of maps was mounted on three panels which extended entirely to the floor and were surmounted by the heading "The Geographical Expansion of American Agriculture from 1840 to 1920.

The *Cooperative Marketing* (Plate 160) statements, text, and colored photographic enlargements showed some of the outstanding facts regarding cooperative marketing in the United States. The growth of the membership of cooperatives from 1890 to 1925 was indicated by the increase in size of a series of enlargements of a typical young American farmer. The center panel of this exhibit supported a screen upon which, by means of a projection lantern, pictures and text concerning the story of cooperation was shown. The screen was set under the arch of a bridge which in a large oil painting was represented as spanning the gap between the farm and the city.

The *Land Economics* booth, (Plate 161) which included one panel referring to farm taxes, showed by maps and charts some of the aspects of farm tenancy, land values, and the situation in the United States in regard to hired farm labor. The central panel supported a large map of the United States upon which the various regions were labeled as to the particular use to which the land is put. The taxation panel showed by maps and charts the basis on which farm taxes are made.

In the booth devoted to *Warehousing and Farm Credit*, farmers and owners of warehouses, in which agricultural products are stored, were shown some of the benefits of the Federal warehouse supervision. The central panel of the exhibit portrayed some of the strong features of a Federal warehouse receipt as compared with the type of receipt often used giving no guarantee either of service or responsibility. The right-hand panel of this booth was devoted to farm credit and showed, by means of charts, the farm credit situation in the United States, including the kinds of security, rates of interest, and distribution of loans among farmers in the various states.

The exhibit in the *Market News* booth showed in graphic form and by colored photographic enlargements how market information is gathered, on what commodities reports are issued, the extent of the Market News leased wire system of the United States Department of Agriculture, and how the reports are distributed to those who have use for them. The central panel supported a large United States map show-

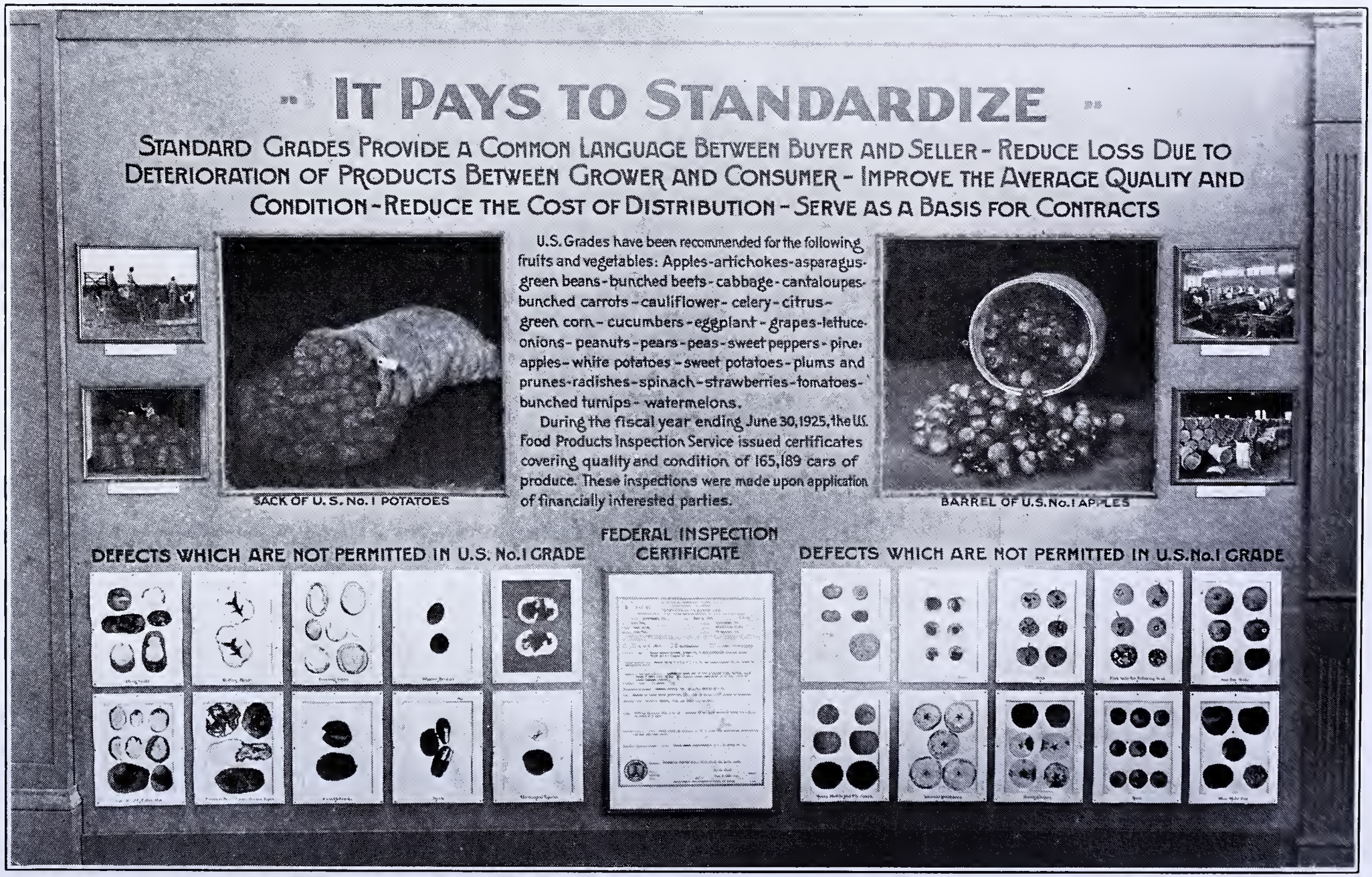

PLATE 162.—A panel exhibit, "It Pays to Standardize," illustrated the advantages of standardization and Federal inspection of fruits and vegetables.

PLATE 163.—Official Standards for American Cottons and the Universal Cotton Standards were shown by replicas in reduced size.

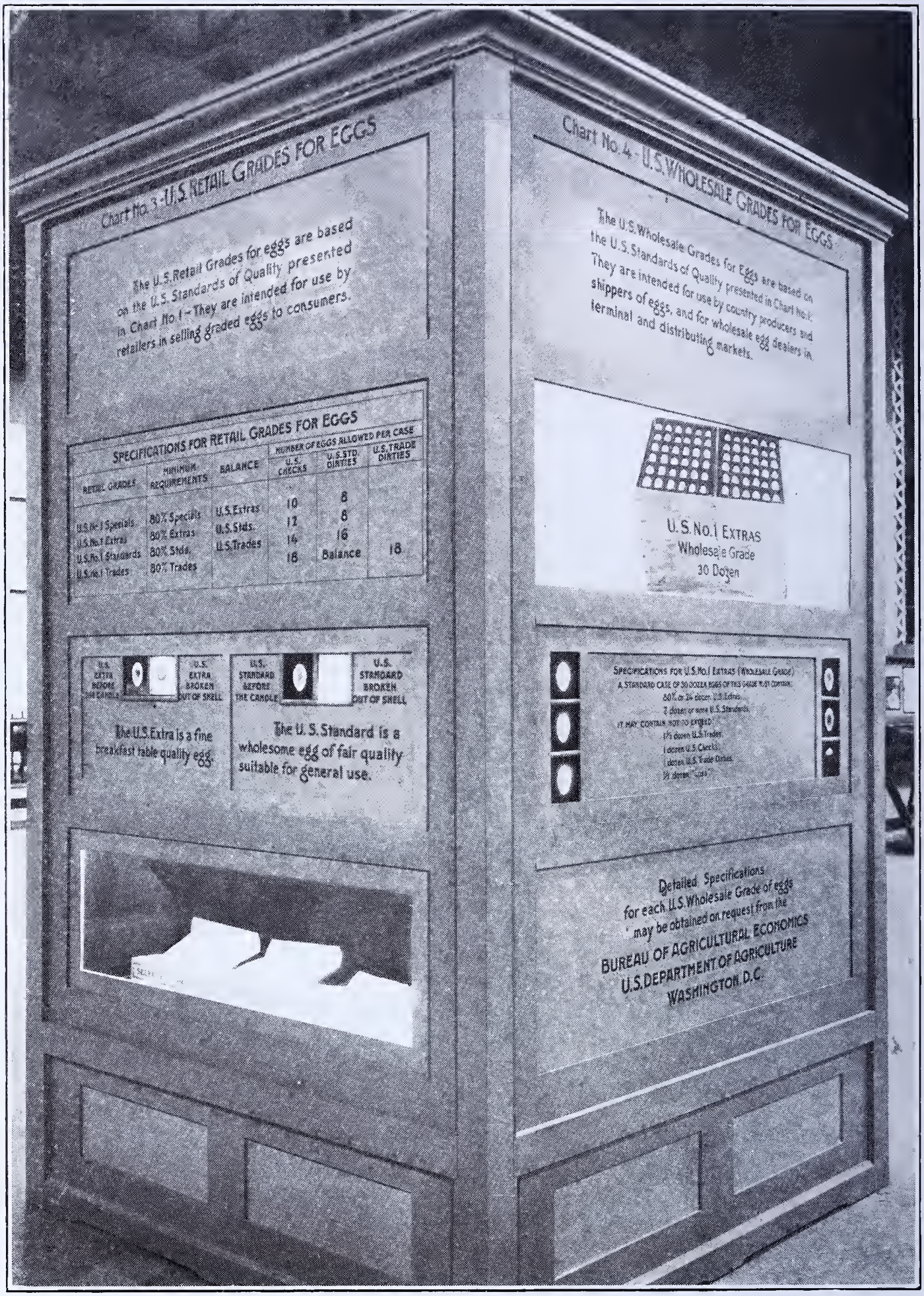

PLATE 164.—Retail and wholesale grades for eggs were explained in the Egg Standardization exhibit.

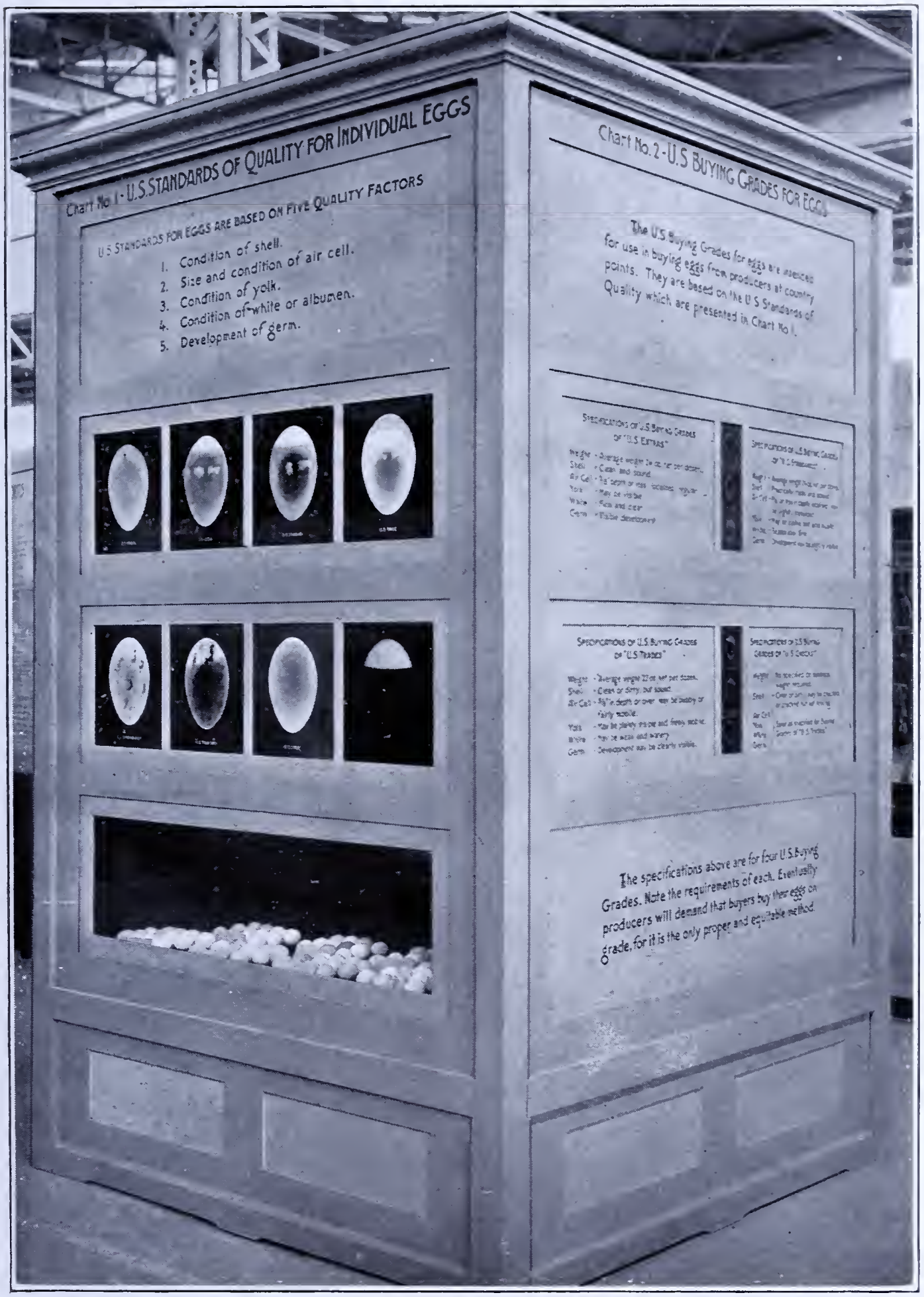

PLATE 165.—Standards of quality for individual eggs and standard buying grades for eggs was explained in the Egg Standardization exhibit.

ing the leased wire system of the United States Department of Agriculture as it now stands, together with some of the most important radio connections and the location of the permanent and temporary field offices.

Standardization of fruits and vegetables was shown on a large full-length panel under the caption *"It Pays to Standardize."* (Plate 162). Although only two commodities, potatoes and apples, were shown on the panel, the entire standardization program was indicated together with the pictorial presentation of the principal defects which differentiate U. S. No. 1 grade for both apples and potatoes from the lower grades. Standardization and inspection go hand in hand, for without inspection standards cannot be established, and therefore the inspection certificate which appeared as a part of the exhibit indicated the kind of service which the inspection staff of the Bureau performs for the benefit of the producers and handlers of perishable farm commodities.

The *Foreign Service* of the Bureau was shown by a large panel on which were two maps, one of the world and one of the United States, under the heading "World Information for American Farmers." Text gave some of the main facts concerning the sources of world information and the means by which the reports are distributed to American farmers. There were also statements regarding the proportion of some of the important imports and exports.

Standardization of Cotton was presented by means of a set of replicas, in reduced size, of the Official Standards for American Cottons and the Universal Cotton Standards. (Plate 163). Narrow panels surmounting this material gave by means of text and illustrations some of the principal facts concerning the work of cotton standardization as handled by the Bureau of Agricultural Economics.

Standardization of Tobacco was represented by a series of twenty-four samples of graded tobacco bearing labels as to their exact grade and classification as determined by the Bureau. These were but a fraction of the complete list of standards but were indicative of the character of the work done in classifying and grading this important farm product.

Egg Standardization was shown by means of colored transparencies and text in small panels supported by an illuminated cabinet 5½ feet square and 8 feet high. (Plates 164 and 165). The importance of egg standardization has led the Department of Agriculture to extensive investigation of the factors upon which standards can be based. These factors were shown plainly by the transparencies in the panels and also on the exterior of the shell of actual eggs shown in the illuminated cabinets. Few persons have had an opportunity of having

PLATE 166.—Livestock Standardization exhibit.

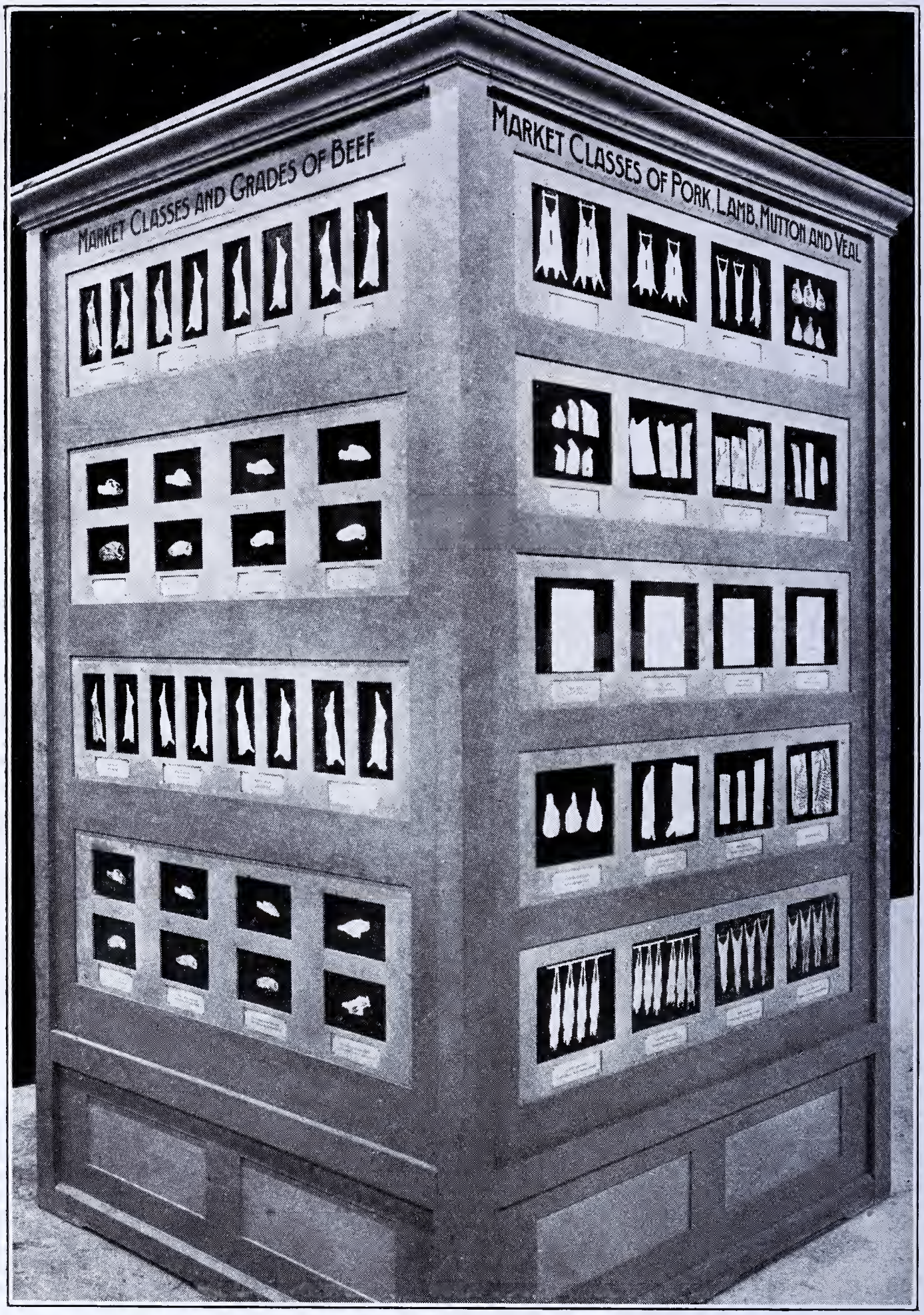

PLATE 167.—Meat Standardization exhibit.

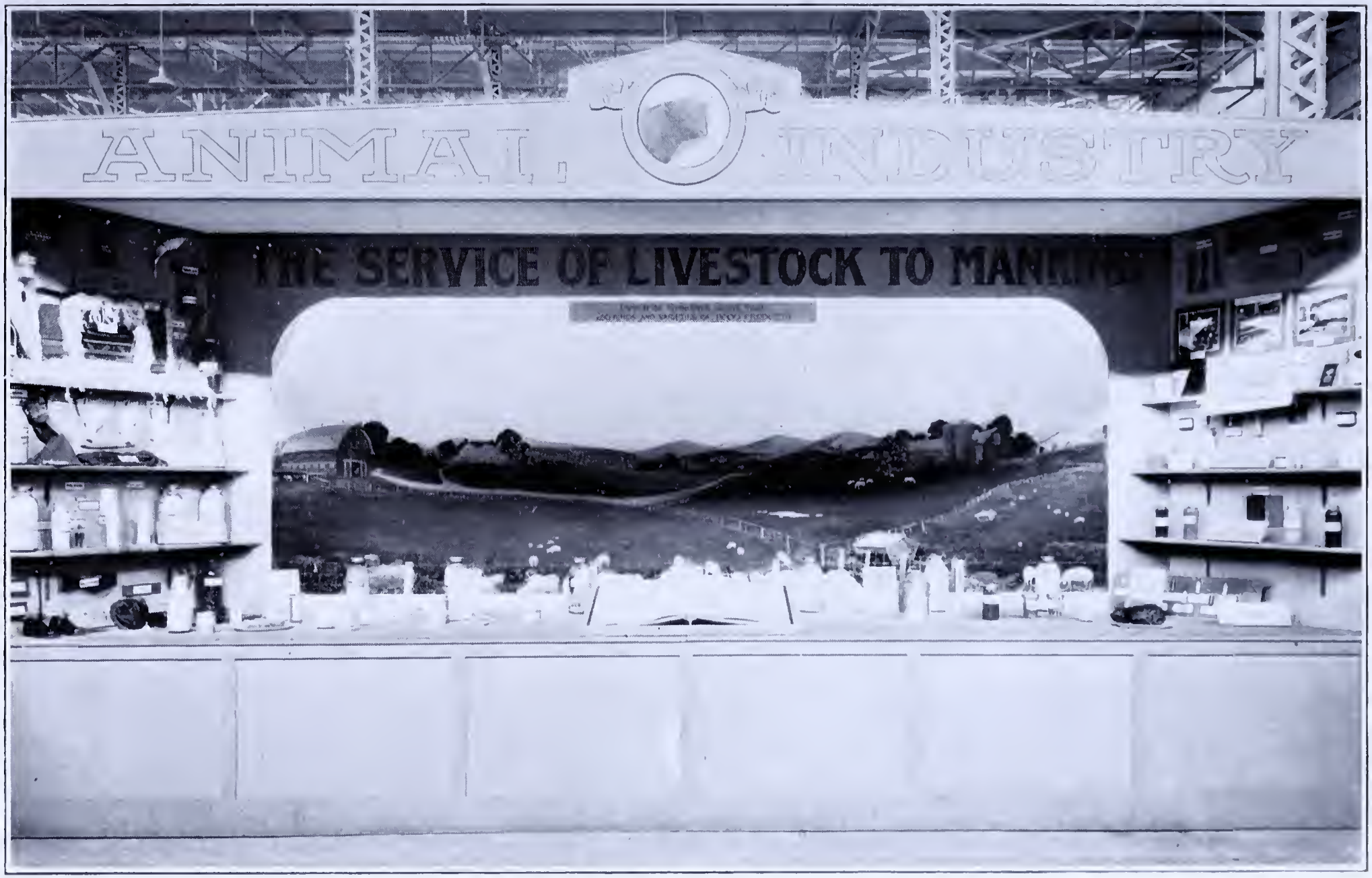

PLATE 168.—The service of livestock to mankind.

these egg standard specifications brought clearly to their attention and for that reason this exhibit is of importance not only to the trade but to the consuming public as well.

The *Standardization of Livestock and Meats* into various grades and classifications was shown by means of colored transparencies in a cabinet 5½ feet square and 8 feet high. The 40 colored transparencies of cattle, sheep and hogs (Plate 166) showed even to the casual observer the fact that market meat animals are of such variety in their characteristics that a system of classification is necessary in order that true values may be determined. The same may be said of the meat which these animals provide when slaughtered. Meat classification was shown in detailed exactness by the 52 transparencies devoted to market classes of beef, pork, lamb, mutton and veal. (Plate 167).

Federal Hay Standards and Inspections, on account of the nature of the commodities, prevented an elaborate presentation of actual bale samples for all classes and grades for the various types of days. Small samples in glass-covered boxes, however, gave an idea of the various characteristics which are considered in determining the grade of different types of hay. On the panel surmounting the table were colored photographic enlargements showing the actual methods employed both in the laboratory and in the hay markets for determining the values of the various factors upon which hay standardization is based.

Wool Standardization was shown by actual graded samples of the official standards for the numerical grades of wool displayed in glass-covered cases. Surmounting these cases were series of charts and pictures representing the physical appearance of the official wool grades and pictures of enlarged wool fibers showing some of the differences in grade.

The proposed standards for mohair were displayed together with pictures of an Angora goat in fleece, also a large pile of fleeces of this very valuable product.

Bureau of Animal Industry

The Bureau of Animal Industry exhibit (Plate 168) presented the usefulness of the livestock industry to man. It was introduced by a central feature entitled "Service of Livestock to Mankind" in which were displayed articles of animal origin. A painting, a panoramic livestock scene, furnished a setting for the central feature. In the scene were portrayed barns, silos, self-feeders, various types of well-bred livestock, pastures, and cereal crops.

More than 250 kinds and varieties of food products are furnished man by the livestock industry besides products derived from leather, bone, wool, hair, glands, sinews, fats, membranes, and offal. In addition to edible milk products there are large numbers of industrial ar-

PLATE 169.—The Horse and its services to mankind.

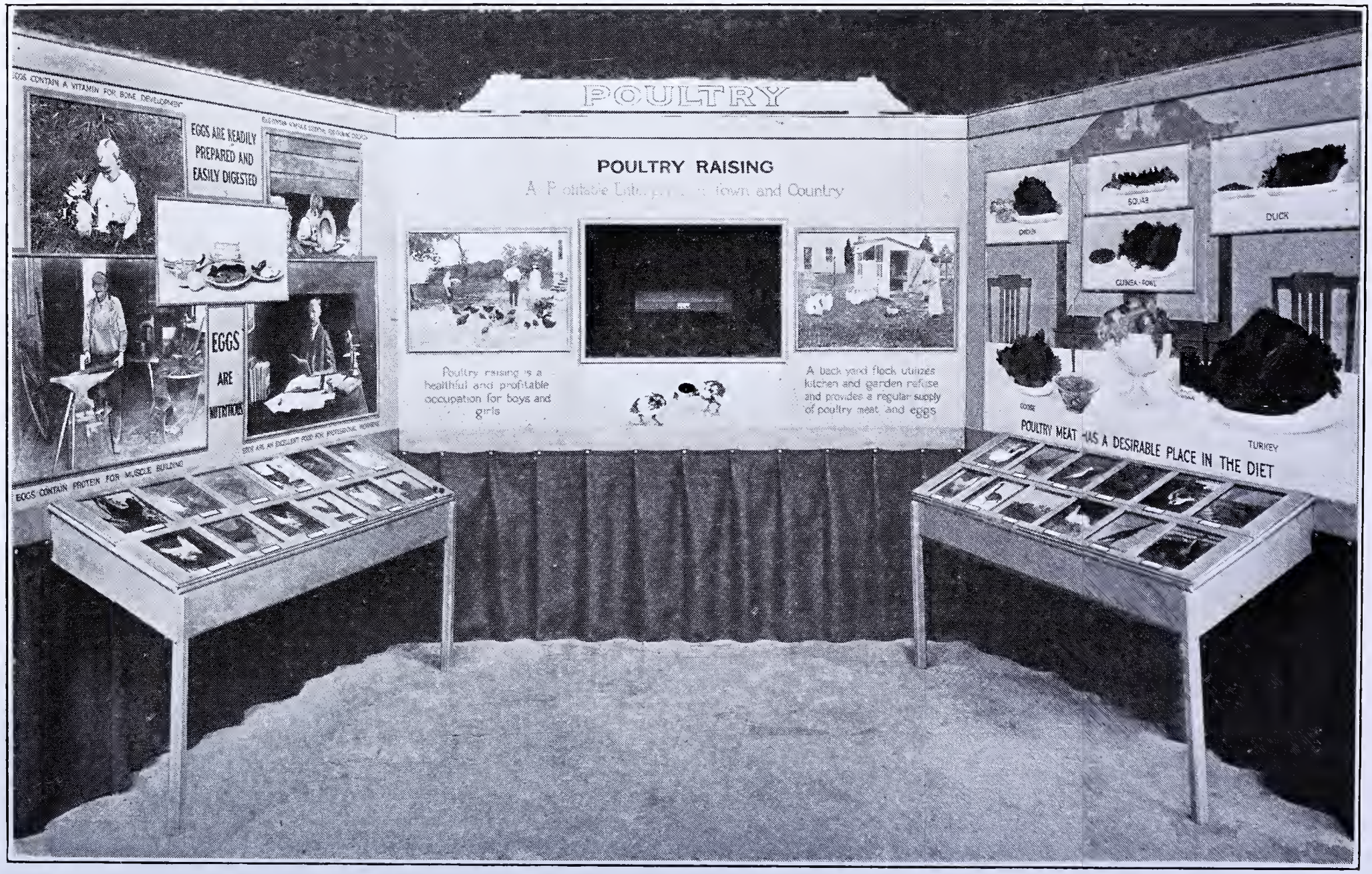

PLATE 170.—"Poultry Raising" a profitable enterprise for town or country.

PLATE 171.—Livestock Quarantine Service.

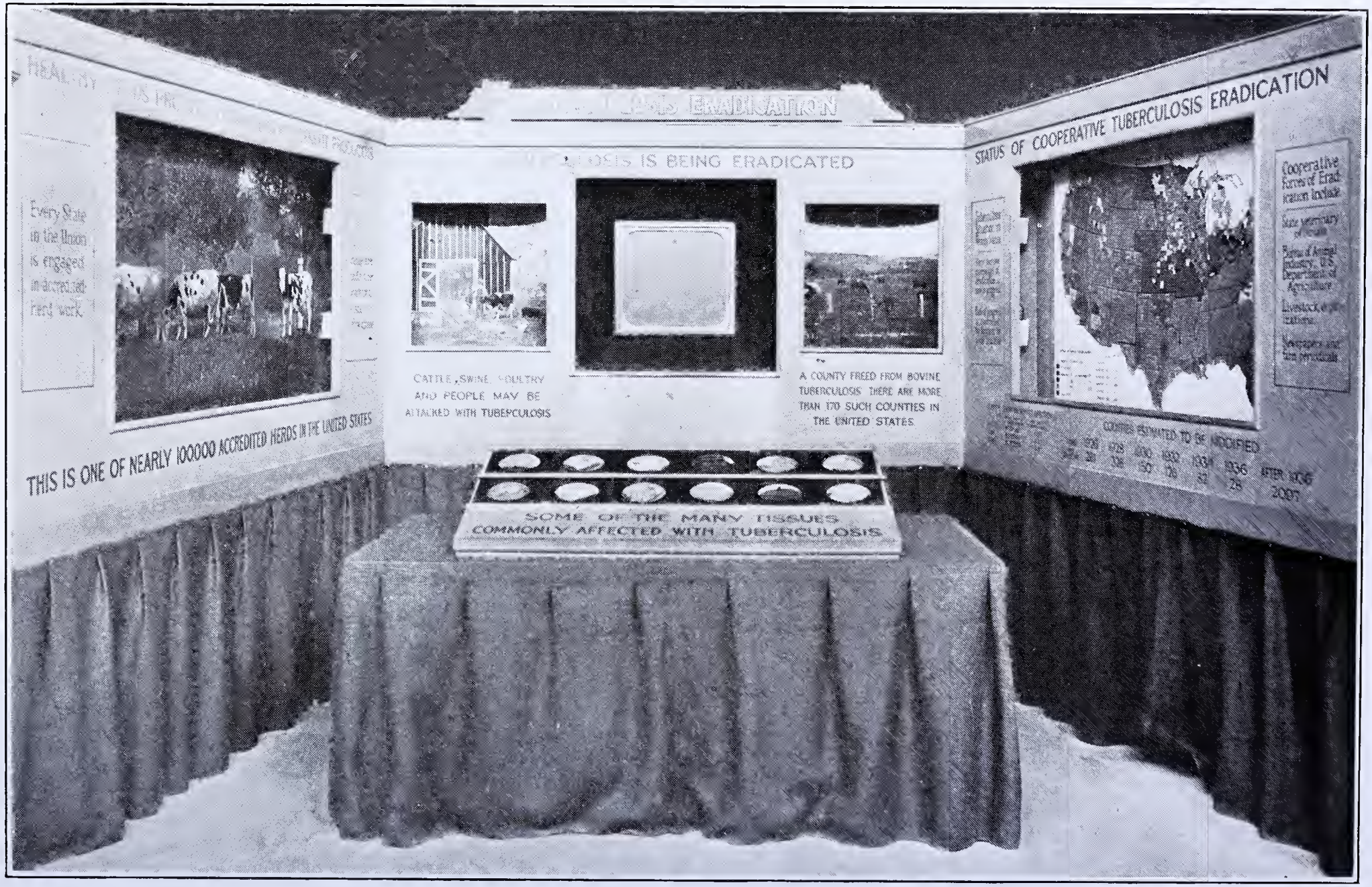

PLATE 172.—Animal tuberculosis eradication.

ticles derived from the solid portions of milk. Samples of scores of typical animal products—many of them unusual and unfamiliar to the general public—were in the exhibit.

The Horse: The horse has been a comrade and ally to man in the development of the country, during the Sesquicentennial period, 1776 to 1926. The United States was shown to contain about 24,260,000 horses and mules, used for varied purposes. The left-hand panel portrayed such uses as cavalry and artillery service, pack-train travel, sport and recreation. On the right hand the uses of horses in agriculture and commerce, including plowing, reaping, and hauling, were shown. (Plate 169). Thus both in national defense and in national development the horse has been a friend and servant. A small motion picture machine in the center panel enabled visitors to see in a few minutes the history of the horse and its constant usefulness to man.

Poultry: Poultry raising as a profitable enterprise in town and country was illustrated by pictures of important breeds and varieties of fowls and uses of their products. A pictorial presentation with suitable descriptions showed that eggs contain protein for muscle building, vitamin for bone development, and essential minerals; that besides being nutritious eggs are readily prepared and easily digested. The right hand portion of the display showed tempting dishes in which chicken, turkey, goose, duck, guinea fowl, and squab were the main ingredients. The suggestion was made also that poultry raising is a healthful and profitable occupation for boys and girls, and pointed out the advantages of a backyard flock for the city grower. An automatic motion picture machine showing poultry supplemented the panel displays. (Plate 170).

Livestock Quarantine Service: Under this title representations of two large hemispheres on a central panel (Plate 171) showed the presence of various animal diseases in other parts of the world and the fact that the United States is entirely free from those plagues. The manner of disinfecting stock cars under Federal supervision and the importance of quarantine regulations were likewise illustrated. Side panels dealt with the means by which foreign maladies are excluded and urged the public to report strange diseases promptly and never to conceal them. They pointed out that not only are many foreign diseases being excluded by quarantine measure, but the veterinary service of the United States, cooperating with State officials, has completely eradicated from this country contagious pleuro-pneumonia, foot-and-mouth disease, and European fowl pest.

Tuberculosis Eradication: The status of tuberculosis eradication in the United States was the subject of a three-panel booth (Plate 172) supplemented by a central display of tissues of animals commonly af-

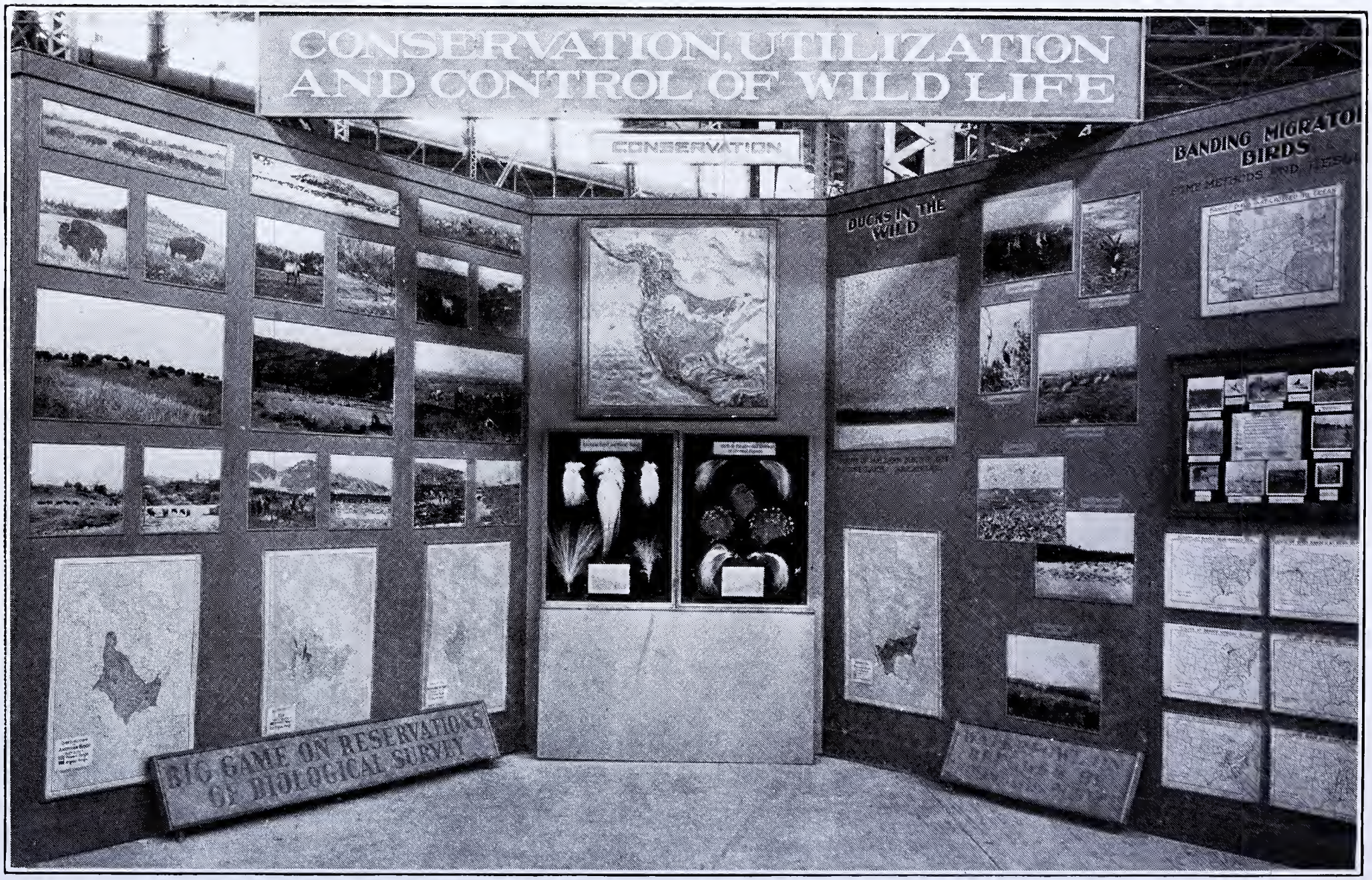

PLATE 173.—Conservation and utilization of wild animals.

fected with tuberculosis. This portion of the exhibit showed that the disease may attack cattle, swine, poultry, and people. A large illuminated map of the United States illustrated the degree of bovine-tuberculosis infection in every state and county, and made the display of personal interest to every one in the country. Pictures of herds that had been freed from tuberculosis by systematic testing, and brief satistics showed the progress being made. A miniature motion picture machine presented other features of tuberculosis-eradication work.

Bureau of Biological Survey

The work of the Biological Survey was portrayed topically under three headings: The Conservation, Utilization and Control of Wild Life. The conservation of game birds, fur animals, and other interesting, useful, or harmless forms of wild life in relation to utilizing wisely the natural increase and preventing an undue abundance of forms that are injurious to man were depicted.

The exhibit was designed to bring to the attention of visitors the wild life of the country, both the beneficial and the injurious—one should receive protection, the other may be destroyed.

The title adopted for the exhibit as a whole read "Conservation, Utilization, and Control of Wild Life," (Plate 173) and the exhibit was planned in three sections, so arranged to have each one thoroughly descriptive of its subject matter.

Conservation of Wild Life. This section was in booth form, the left panel 12 by 11 feet, the center panel 6 by 11 feet and right panel 12 by 11 feet. The left panel had on it pictorial reproductions of scenes on Federal reservations, showing the big game being maintained there, with maps portraying the original and the present distribution of these animals.

The center panel contained a large relief map of North America depicting in color the natural life zones of the continent—transcontinental belts having certain characteristic association of animals and plants. Beneath this was a cabinet containing plumes of egrets (aigrettes) and of birds of paradise, articles that are prohibited by law from being worn for personal adornment or otherwise, because of the danger of extermination of these species.

The right panel had illustrations similar to the one on the left, but dealt with the wild life on Federal bird refuges. There were also included on this panel a collection of bird bands, descriptions of methods of banding, and maps showing the migration flights of individual birds as determined by return records obtained from reports on the bands they carried.

PLATE 174.—Wild duck hunting scene.

PLATE 175.—The muskrat habitat.

PLATE 176.—Control of wild animals.

Utilization of Wild Life. This section consisted of three units, the first being a painted back drop 10 by 15 feet, with a natural habitat foreground depicting shore bird life and so arranged as to make a unified scene with the painted background.

The second unit was similar to the first in size and construction. (Plate 174). It showed a flight of ducks, and made a complete duck-hunting scene, suggesting the utilization of these birds for food or sport.

The third unit (Plate 175) consisted of a back drop scene of a marshland with a flight of geese in the distance. The foreground represented a typical muskrat habitat with muskrat houses and mounted specimens of the fur-bearers themselves in characteristic poses. The muskrat was selected because it is the most important North American fur-bearing animal, supplying as it does from twelve to fourteen million pelts annually for use in the fur trade. An explanatory panel detailed the need for the application of practical conservation methods in the production of muskrats for the maintenance of this natural fur supply.

Control of Wild Life. The third section of the Biological Survey exhibit (Plate 176) consisted of mounted specimens showing the depredations of certain species of wild life on useful game birds and mammals, and on domestic livestock. There was portrayed the necessity for the control of these injurious animals. A mountain lion was shown bringing down a deer, a bobcat destroying a grouse, two wolves attacking a range calf, and a coyote in the act of killing a lamb.

The walls at the rear on the left side were hung with the pelts of predatory animals, and a case at the right contained mounted specimens of rodents and other small mammals that affect crop production and are injurious to agriculture.

Bureau of Chemistry

The Bureau of Chemistry exhibit (Plate 177) included a working laboratory for demonstrating the analysis of insecticides, foods and drugs, and for the exhibition of apparatus especially designed for that work; illustrating the proper preparation of skins and hides; apparatus for testing the wearing qualities of leather; demonstrating the preservative treatment of fabrics; demonstrating the dust explosions in grain elevators and manufacturing plants; and presenting the activities of the Bureau in connection with the food and drugs and other Federal acts.

Food Colors. This exhibit consisted of a panel upon which were mounted samples of coal tar colors, and of candy colored by their use. It was designed to show the necessity in the use of food colors that their purity be assured by examination and certification. The Color

PLATE 177.—The Bureau of Chemistry exhibit included a working laboratory and apparati for demonstration of the Bureau's work in connection with food and drugs, insecticides, leather, fabric, preservations, dust explosions and other activities.

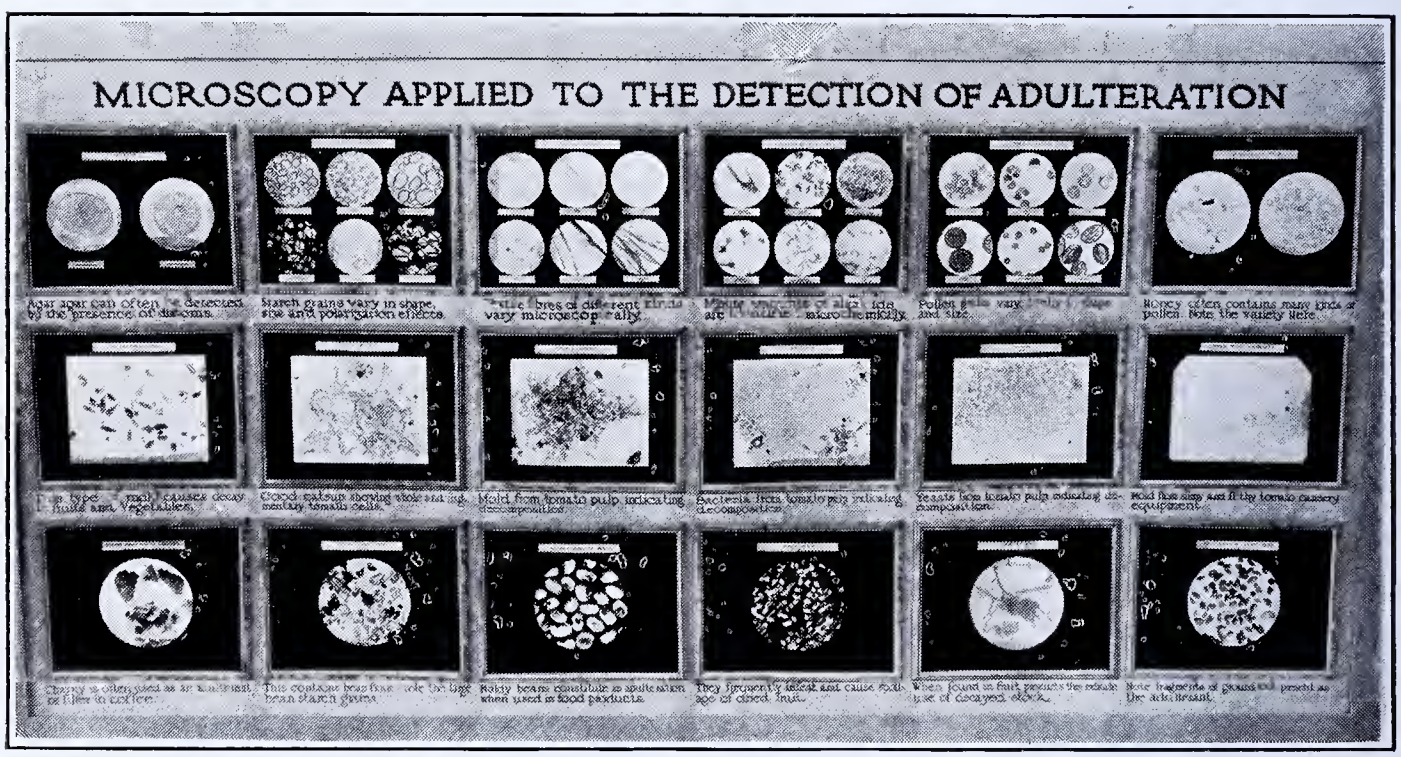

PLATE 178.—Many kinds of food adulteration can be detected only by the microscopic examination of the product.

Laboratory issued certificates for more than 600,000 pounds of food colors during the year ending June 30, 1926.

Food and Drugs Act Enforcement. The Bureau of Chemistry is charged with the sampling and examination of foods and drugs offered for importation that enter interstate commerce or otherwise come within the jurisdiction of the law. The enforcement of the Act is one of the important regulatory activities of the Department of Agriculture, and was illustrated by a three-panel booth.

The *central panel* in this booth presented a map upon which was shown the location of the stations outside of Washington where food inspectors and analysts may be reached by the public and enabled the visitors to visualize the methods by which control is exercised through the divisions of the territory into Eastern, Central and Western Districts, each with branch stations distributed throughout its territory.

The *panel on the left* presented a series of views showing the procedure in the inspection of imported foods and drugs; arrival at port; unloading; sampling at custom house or upon wharf; examination at laboratory and the destruction of products unfit for entry.

The *panel on the right* enabled the visitor to follow the procedure in the collection, examination, and finally, the seizure and destruction of adulterated domestic products condemned by the courts.

Microscopy Applied to the Detection of Food Adulteration. Many forms of food adulteration can be detected only by microscopic examination of the product. This panel (Plate 178) was devised to illustrate a few typical cases of this kind, most of which relate to the enforcement of the food and drug law. Among the subjects illustrated in the panel were some of the common forms of starch grains showing how they vary in size and form. Pollen grains by their various sizes and configurations are used as a means of detecting the flower source of many kinds of honey. Alkaloids even in minute quantities when treated with various reagents produce distinctive forms of crystals which are often of great assistance in identifying them in residues from drug products. The detection of food products made from more or less moldy or decayed raw materials is most readily accomplished by a determination of the mold filaments or other microorganisms present. In the study of textiles, the microscope is preeminent as a means of identifying the kind of fibers used in their manufacture.

Insecticide and Fungicide Laboratory. This exhibit was a collection of the most important materials used as insecticides and fungicides (including disinfectants) and the raw materials from which these products are made. The products were grouped to indicate their origin and the various uses to which they are put, namely, stomach poisons such

as lead arsenate, calcium arsenate and other compounds of arsenic; oil emulsions and miscible oils used as contact insecticides; nicotine, pyrethrum and other insecticides of vegetable origin; fungicides prepared from copper, from sulfur and from mixtures of such preparations with insecticides; fumigants such as cyanides and carbon disulfide; and disinfectants such as formaldehyde, chlorine derivatives and coal tar products.

Tea Inspection Service: The Tea Inspection booth was designed for illustrating the testing of tea for quality and purity. The pictures were divided into two sets of three pictures each, showing the three most important tests that are made for quality and the three motions in the making of the Read tests for purity. To produce the result, one scene in each series was painted in oil on canvas. In front of this was another scene in each series painted on wire mesh of a definite size and still in front of this was a third picture painted on wire of a different size from the screen back of it. These three different pictures were brought to the attention of the persons viewing them at intervals by lighting up the different screens one at a time.

The exhibit showed the general public how carefully all teas entering the United States are examined under the Tea Act, which protects it from impure and unwholesome teas, and that the tests are made not only for purity but also for quality. The panels on this exhibit were also educational in that they informed about the cultivation and manufacture of tea. Moreover, the exhibit told the visitor how to prepare a cup of tea. This exhibit was closely related to the cassina exhibit which showed development of an American plant that can be used for tea, and is also closely related to the exhibits under the food and drug act.

The Cassina Exhibit consisted of a panel that showed the development of a research project, covering the working out of technical processes for manufacturing from the leaves of an indigenous plant, *Ilex Cassine*, Walter, various beverage producing products and flavoring extracts. This project has great economic importance to the United States because cassina grows wild over an area of about 40,000 square miles, occupying the coastal lands from the James River in Virginia to the Rio Grande in Texas. The lands on which this plant grows so luxuriantly are practically unfit for other field crops. The leaves contain caffeine. It can be harvested by machinery and when this industry is commercialized it will furnish the people of the United States with a product that can be used similarly to tea and coffee at much less cost. The plant is of further economic importance. It can be utilized for the manufacture of flavoring sirups and flavoring extracts. Inasmuch as it thrives on much of the land that has been devastated by the cotton

boll weevil it offers opportunity for establishing a staple crop to take the place of cotton in the coastal regions of the South.

Phytochemical Laboratory Exhibit. This exhibit consisted of a glass fronted case containing samples of caffeine obtained from *Ilex vomitoria* (Cassina) (see description of Cassina exhibit), the odorous constituents of fruits, particularly apples and peaches, and the odorous constituents of the cotton plant, all of which have been isolated in that laboratory.

As a result of the investigation of *Ilex vomitoria*, a native species of holly, it has been shown that the leaves of this plant can be utilized for the production of caffeine, which is an important medicinal substance.

It is only within recent years that anything has been known regarding the nature of the substances which impart to certain fruits their characteristic odor. An investigation of the apple has shown that its fragrant odor and to a certain extent its flavor are due to a complex mixture of substances consisting chiefly of amyl esters and acetaldehyde together with a small proportion of geraniol and its esters. As a result of this investigation it was found possible to produce a synthetic apple oil which is well adapted for imparting to beverages, ice cream, etc., the characteristic apple flavor.

The odorous constituents of peaches have likewise been examined and these have been found to consist chiefly of esters of linalool, together with a considerable proportion of acetaldehyde.

The investigation of the odorous constituents of the cotton plant was undertaken in order to ascertain the nature of the substances which are presumed to attract the boll weevil. In the course of this work a large number of definite chemical compounds were isolated from a steam distillate obtained from the fresh plant. The results of this investigation will form a basis for more extended experiments in the control of the boll weevil.

The Protein Exhibit contained specimens of twenty-five purified proteins, which have been isolated from some common foodstuffs. The nutritive value of human foods and animal feeding stuffs is largely judged on the basis of their protein content. Formerly, it was believed that all proteins had the same nutritive value, but scientists have proven that some proteins are lacking in certain constituents which are essential for normal growth and nutrition of animals. Future progress in the proper rationing of farm animals, as well as in the field of human nutrition, must be based largely upon accurate knowledge of the nutritional quality of the proteins in different foodstuffs.

Filtration and Vacuum Apparatus. The process of removing undissolved solid particles from liquids was shown by ultrafiltration ap-

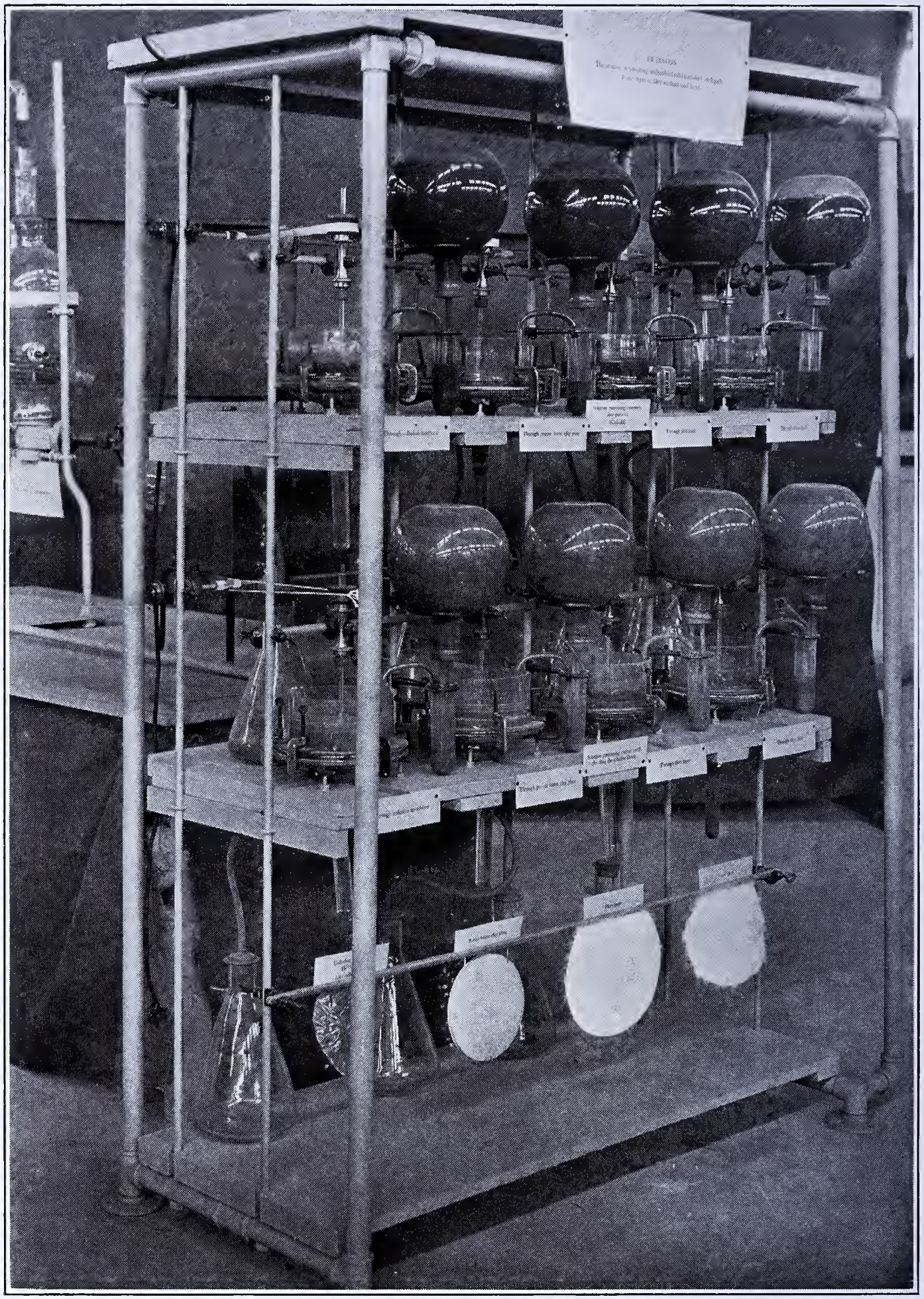

PLATE 179.—Ultrafiltration apparatus. The process of removing undissolved solid particles from liquids.

paratus designed for the quantitative separation of colloidal material from sugar factory juices and products to aid in the study of cane and beet sugar factory problems. (Plate 179).

The apparatus was originally intended for ultrafiltration (the filtration of colloidal solutions through collodion membranes), but for the purpose of exhibit, it was arranged to demonstrate filtration of two different types of solutions through four different types of filter media.

The glass vacuum pan shown which stood at the left of the filtration plant was designed for constructive study of certain cane and beet sugar manufacturing problems. It was a small scale reproduction of a vacuum pan which permits the exercise of the sugar boiler's art under controlled conditions. It was designed so that the various operations of producing grain, growing crystals of desired size, boiling mixed strikes, reducing the run-off to the desired purity, etc., could be performed in a satisfactory manner.

Preservative Treatments for Fabrics. This booth contained three panels entitled: "Waterproofing—Mildewproofing—Fireproofing:" "Pigments Protect Fabrics from Injury by Sunlight:" and "Food for Thought is Often Bound in Food for Roaches."

The *first of these panels* told what may be accomplished by proofing treatments; pointed out the fact, discovered in the Bureau of Chemistry, that certain kinds of commonly used waterproofing materials cause deterioration in strength; gave two of the Bureau's formulas for waterproofing canvas; showed samples of canvas treated by these formulas in combination with different pigments; and illustrated with two colored pictures, how treatments may be applied at home. It told how to care for fabrics to avoid mildew and what substances to incorporate with waterproofing materials to increase mildew resistance. It told also, how to flameproof cotton fabrics not exposed to wetting, pointed out that practical fire-proofing of canvas so that its fire resistance is not lost on wetting is still an unsolved problem, and called attention to the fact that some chemicals used for fireproofing seriously weaken cotton fabrics.

The *second panel* gave results obtained by the Bureau of Chemistry on strength lost by treated and untreated, colored and uncolored, canvas and tobacco shade cloth on exposure to the weather. Framed samples illustrated the appearance of the treated and untreated fabrics used in the experiments. The figures for loss in strength were placed above and the kind of treatments applied were described beneath the samples. In the case of the canvas it was shown that two uncolored waterproofing treatments caused the canvas to deteriorate more rapidly on exposure than the untreated canvas but that different pigments added to these same waterproofing treatments decreased the rate of de-

terioration. With one treatment the addition of burnt umber reduced the loss in strength after six months exposure from 90 per cent to 19 per cent. With the other treatment the addition of lampblack decreased the loss from 65 per cent to 13 per cent. In the case of tobacco shade cloth it was shown that whereas untreated cloth lost 49 per cent of its strength in one season, making it unfit for further use, cloth subjected to one pigment treatment lost 18 per cent and cloth subjected to another pigment treatment lost only 6 per cent and was unquestionably strong enough for a second season's use. Since around $70,000,000 is spent annually in the United States on fabrics for outside use including tents, awnings, sails, wagon, shock, and goods covers, and tobacco shade cloth, and since sunlight is usually the chief deteriorating agency, the general application of the lesson taught by this panel is of great importance.

The *third panel* showed a large colored picture of roaches devouring the coating materials on cloth bound books, several damaged book covers from the library of a roach infested building, specimens of three kinds of roaches that caused the damage, and samples of resistant and nonresistant book cloths. It called attention to the fact that many book cloths contain 35 per cent and more of edible filling materials like flour, starch, dextrin, casein, and glue, which roaches greedily devour, leaving the cloth blemished and bare. It pointed out further that roach-proof book covers either must not contain such appetizing fillers and finishes or must be made to repel or resist roach attack by means of water-repellant finishes like a celluloid lacquer and shellac. Samples of new filled book cloth, a piece of the same after washing out with water, and another piece after exposing to roaches brings out the astounding fact that the cloth loses 46 per cent of its weight on washing out with water, and that it loses 36 per cent of its weight on being eaten out by roaches. Two book covers, each having one-half treated with water-resistant finishes before exposing to roaches, showed strikingly the protective value of such finishes. This panel illustrated the flimsiness of ordinary book cloths and the temporary character of the ordinary finishes for book cloth, and showed the desirability of more permanent, water-resistant finishes to protect books not only from attacks by roaches, but also from spotting by water.

The exhibit on "Preservative Treatments for Fabrics" was supplemented by one of covered farm wagon models under sprays of water, and of a funnel test to show the effectiveness of waterproofing treatments for canvas.

Waterproofing Treatments for Canvas. This exhibit was in two parts: One part consisted of two models of canvas-covered farm wagons and a device for spraying water over them. The cover for one

PLATE 180.—The sole leather tester demonstrated that soles from the "bend" wear longer than soles from other portions of the hide.

wagon was untreated canvas and that for the other was canvas of the same kind which had been subjected to a dark-colored water-proofing treatment. On two sides of the table supporting the models were legends identifying the untreated and treated covers, telling how the treated cover was waterproofed and calling attention to the fact that both covers were exposed to summer weather for three months previous to mounting. Through the open front and rear ends of the wagons, the observer could see how readily the water penetrated the untreated cover and how it was shed by the one that was treated.

The other part of the exhibit consisted of a wooden rack bearing four six-inch glass funnels containing pieces of treated and untreated canvas folded and opened as inverted cones to fit the funnels. Water was poured upon the fabrics in the funnels to demonstrate their relative water resistance. Beneath the stems of the funnels were graduated glass cylinders. The cylinder beneath the fabric labeled "Good" contained no water. The other cylinders contained different quantities of water; just a little in the one beneath the fabric labeled "Medium;" considerable in one beneath the fabric labeled "Poor," and still more in the one beneath the fabric labeled "Untreated." A lettered panel told how to test water resistance by the six-hour modified funnel test devised by the Bureau of Chemistry. This exhibit, which was associated with the booth exhibit on "Preservative Treatments for Fabrics," strikingly demonstrated the effectiveness of one of the Bureau of Chemistry water-proofing treatments. It also showed how water resistance of canvas can be determined in a simple manner on comparatively small samples, thus enabling one to avoid the purchase of treated canvas not properly waterproofed.

Shoe Sole Tester. An exhibit on the wearing qualities of sole leather.

The results of actual wearing experiments conducted by the Bureau with boy scouts, soldiers, and civilians, were clearly visualized by suitable text on actual specimens of leather. (Plate 180).

In the background was shown a side of leather and the relative wearing quality of the bend, shoulder, and belly sections, into which sole leather sides are divided by the shoe trade. Soles from the bend wear on the average one and one-half times as long as soles from the shoulder and twice as long as from the belly. When one sole of a pair of shoes wears out so much sooner than the other, it is often because it came from a poor section of the hide.

The lesson taught by the panel on the right was that chrome tanned sole leather wears longer than vegetable tanned sole leather, and that unwaxed chrome leather makes the most durable soles, the latter being a discovery first brought out by the experiments referred to on the panel.

PLATE 181.—"Country" hides and skins constitute about one-third of the domestic supply. Each year many are ruined because of inefficiency in skinning, curing, and marketing and each pound thus lost increases the cost of leather and also dependence upon foreign countries, from which nearly one-half the total supply is obtained.

CARE OF COUNTRY HIDES AND SKINS

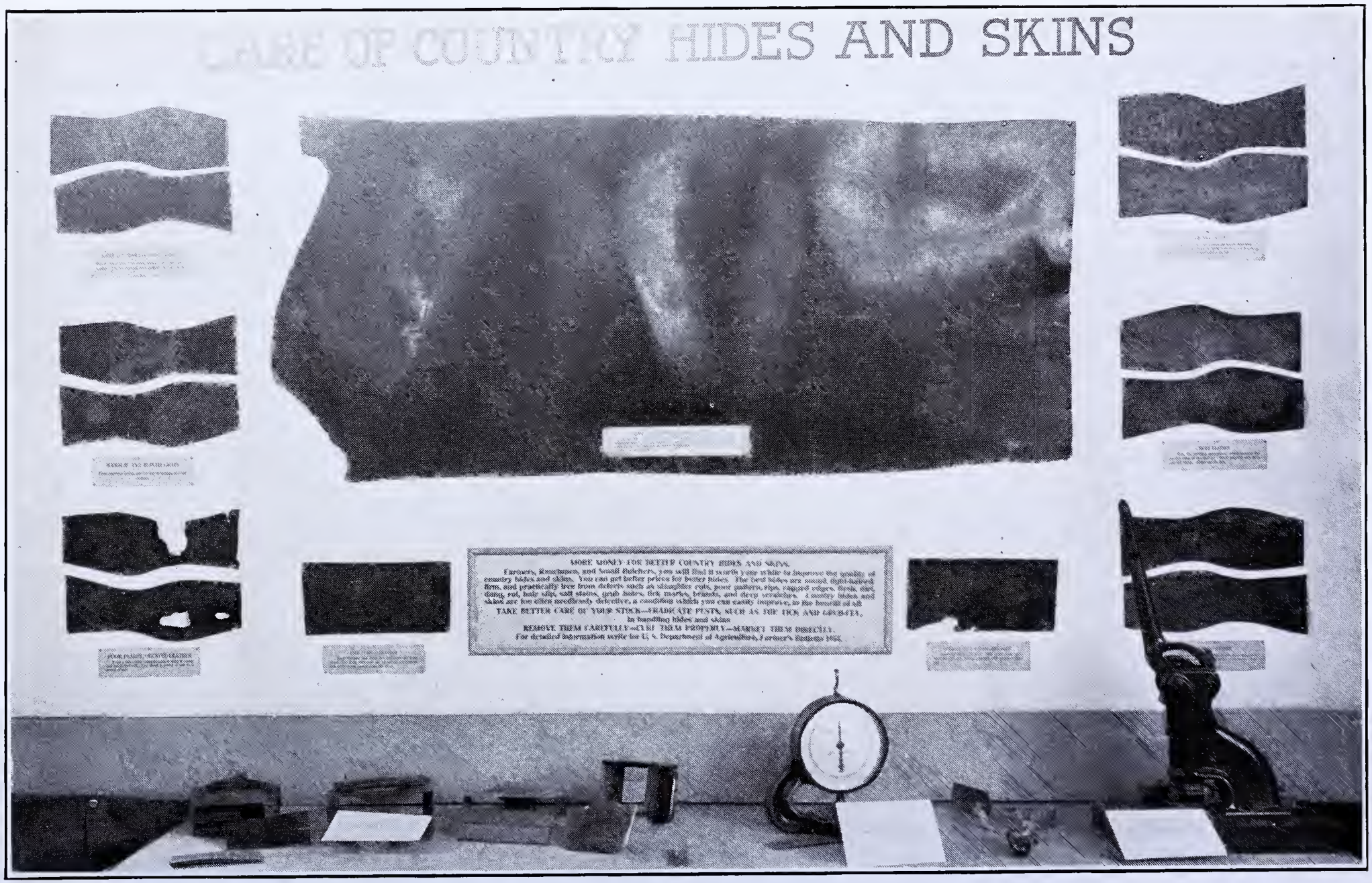

PLATE 182.—With an annual "country" production of about 8,000,000 cattle hides and calf-skins, savings in leather values through proper care and handling mean large economic gains.

PLATE 183.—Proper care and prompt repair kept a piece of harness in service 26 years. Another piece because of neglect was a "wreck" at the end of three years. The national expenditure for leather and leather articles is almost two billion dollars.

In the foreground was shown one of the first machines developed along scientific lines for the mechanical testing of the wear of shoe soles. An entirely satisfactory machine for this purpose would be of immense value not only scientifically but also industrially since it would provide an accelerated, comparable test, where the effects of various process changes upon the quality of the resulting finished leather could be most expeditiously studied.

This exhibit was associated with the other exhibits on hides and leather.

Skinning Animals: This panel (Plate 181) illustrated by means of drop slides the successive steps in skinning cattle and was lettered with terse text on the essentials of skinning, curing, and marketing "country" hides and skins. With an annual "country" production of about 8,000,000 cattle hides and calfskins the saving in leather values of but one dollar per hide or skin means an aggregate economic gain of $8,000,000 a year.

Care of Country Hides and Skins. This panel (Plate 182) carried actual specimens of defective leather from improperly handled hides and skins whose poor quality was strikingly brought out by contrast with an adjacent "bend" of nearly perfect leather and by pertinent legends.

Equipment used in sampling and testing leather was displayed on a table.

This exhibit was associated with the others on hides and leather.

Care of Leather. The possibilities of prolonging the useful life of leather articles by proper care and prompt repair were brought out by a display on a panel of photographs of shoes, machine belts, and harnesses, and particularly, by an actual specimen of a well preserved piece of harness after 26 years' service as compared with another piece that, because of neglect, was a "wreck" after only three years' use, or rather, misuse. (Plate 183).

The public's annual bill for leather and leather articles is almost $2,000,000,000, of which about three-fourths is spent for boots and shoes alone. At present each person wears out about six pairs of shoes every two years. Not at a sacrifice but by the exercise of some judgment and reasonable care, it is easily possible to reduce the individual biennial shoe needs to at least five pairs, or a saving of 16 2/3 per cent, which applied to the National shoe bill means an aggregate saving of $250,000,000 a year.

Bureau of Chemistry Publications on Leather and Related Subjects: This was a cabinet display of some of the publications by the Bureau of Chemistry on leather and related subjects.

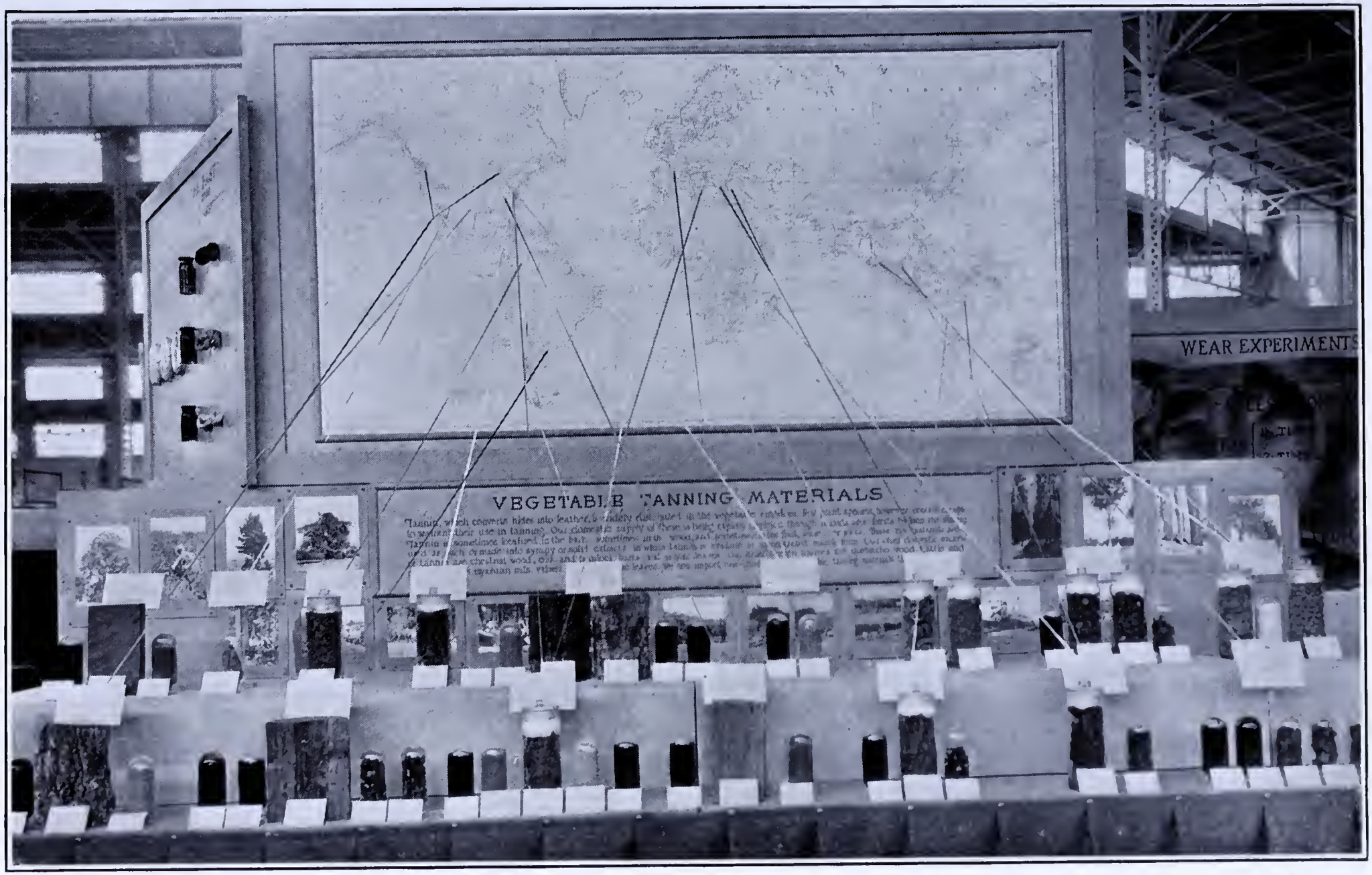

PLATE 184.—Nature in her but little understood way concentrates "tannin" the vegetable material with which leather is tanned sometimes in the bark, sometimes in the wood, and sometimes in the fruit, leaves, or roots of a plant. The exhibit showed by samples what the raw material and tanning extracts look like.

The other side of the cabinet was a panel of transparencies showing, at slight magnification, the natural grain of leathers from different kinds of skins. The "pattern" or "grain" of a piece of leather, formed by the hair holes, scales, fine wrinkles, and other natural markings, is characteristic of the kind of skin from which it is made.

This cabinet was a part of the exhibit on hides and leathers.

Vegetable Tanning Materials: Was an exhibit on vegetable tannin showing by a map, colored ribbons, and informing labels the names and important world sources of these raw materials; by pictures, how some appear as they grow; and by relatively large samples, what the collected raw materials and tanning extracts of the same look like. (Plate 184).

The intent primarily was to give the public a better and clearer idea, in an attractive way, of just what is used commercially for the tanning of so-called vegetable leathers and to bring out the interesting fact that the tanning material is sometimes concentrated in the bark, sometimes in the wood, and sometimes in the fruit, leaves, or roots of a plant. Our decreasing domestic supply of these raw materials and our consequent increasing dependence for them upon foreign sources was also emphasized. Conservation of our domestic supplies and development of new ones is a matter of economic importance.

This exhibit was associated with the others on hides and leather.

Explosive Dust—An Industrial Menace. The dust explosion booth designed to illustrate the hazard of dust explosions in industrial plants and the recommended methods of preventing such disasters, contained as the principal feature several views of a large grain elevator painted on screens and canvas, and a noise-making device. The illumination of the individual paintings and the operation of the "thunder sheet" were so timed as to give the effect of the destruction of an industrial plant by a dust explosion. The side panels illustrated the causes of such explosions and the methods of preventing them.

The purpose of the exhibit was to call attention to the dust explosion hazard which, in this country alone, causes annually the death and injury of many employees and the destruction of millions of dollars worth of property in industrial plants. The dust explosion hazard exists in 28,240 establishments employing 1,324,442 persons, and having an annual production estimated at $10,013,270,936.

Two operating models and an automatic balopticon were used in connection with the dust explosion exhibit to demonstrate how dust explosions may be caused and controlled, and to illustrate the extent of the hazard in various industries.

The dust explosion elevator, a sheet metal model of a grain handling plant, contained equipment with which a small quantity of dust could be thrown into suspension by a blast of compressed air and a spark

PLATE 185.—Ten glass front cases showed in five year periods, the progress made in the Dairy Industry from 1876 to 1926.

produced to ignite the dust and air mixture. A sheet of paper clamped over the tower served to confine the dust and air mixture until the explosion occurred when it would be ruptured with a loud report.

The other model, a miniature feed grinding mill, was used to illustrate the method developed to utilize inert gas, or boiler flue gas, to prevent dust explosions during grinding operations. The model was operated electrically and an explosive dust circulated through the mill, the receiving bin below it, and the collector above. The small pipe presumably carrying gas to the mill from the flue of the adjoining boiler was in reality connected to a storage tank containing carbon dioxide, one of the inert constituents of flue gas. In operation the supply of inert gas could be controlled so that with a sufficient supply in the milling system an electric spark could be produced within the dust cloud without producing an explosion. When the supply of inert gas entering the mill was shut off the producing of the spark caused an explosion, which was relieved through the vent shown on the roof of the model.

The automatic balopticon contained 70 colored lantern slides, each one of which was in turn thrown on the screen. These slides showed the damage caused in various dust explosions investigated by the Bureau of Chemistry, and a legend appearing with the photograph called attention to the extent of the losses, both in life and property. Slides showing the methods worked out to reduce the dust explosion hazard in various industries were also included.

This part of the dust explosion exhibit was designed to demontrate that many types of dust will explode; that under certain conditions such explosions can be prevented or controlled; and to call attention to the enormous losses caused in various industries by such disasters.

Two panels used in connection with the dust explosion exhibit called attention to the hazard of static electricity, one of the causes of dust explosions and fires in threshing machines and of fires in cotton gins. In one season approximately 300 threshing machines and over $1,000,000 worth of grain were destroyed by such explosions and fires in one small section of the country under observation. The damage to cotton gins and the destruction of cotton during one season in the State of Texas alone was estimated at $1,000,000. Photographs and diagrams used on the panels illustrated the method developed for the control of this hazard.

Bureau of Dairy Industry

The exhibit of the Bureau of Dairy Industry showed the progress that has been made in the dairy industry from 1876 to the present time. This exhibit (Plate 185) was contained in ten glass-front cases, each 10

PLATE 186.—Progress in Dairying, 1876-1880.

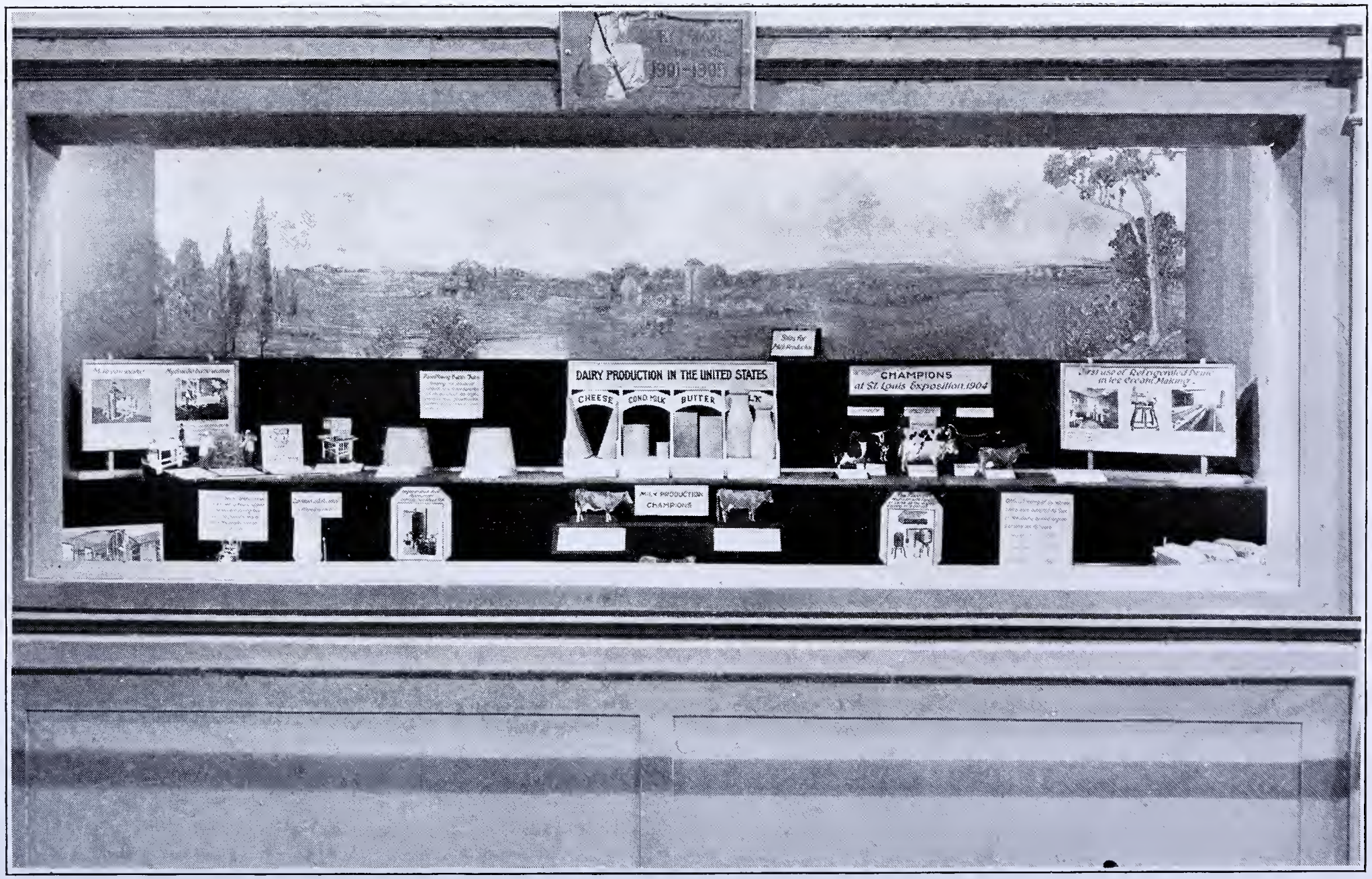

PLATE 187.—Progress in Dairying, 1901-1905.

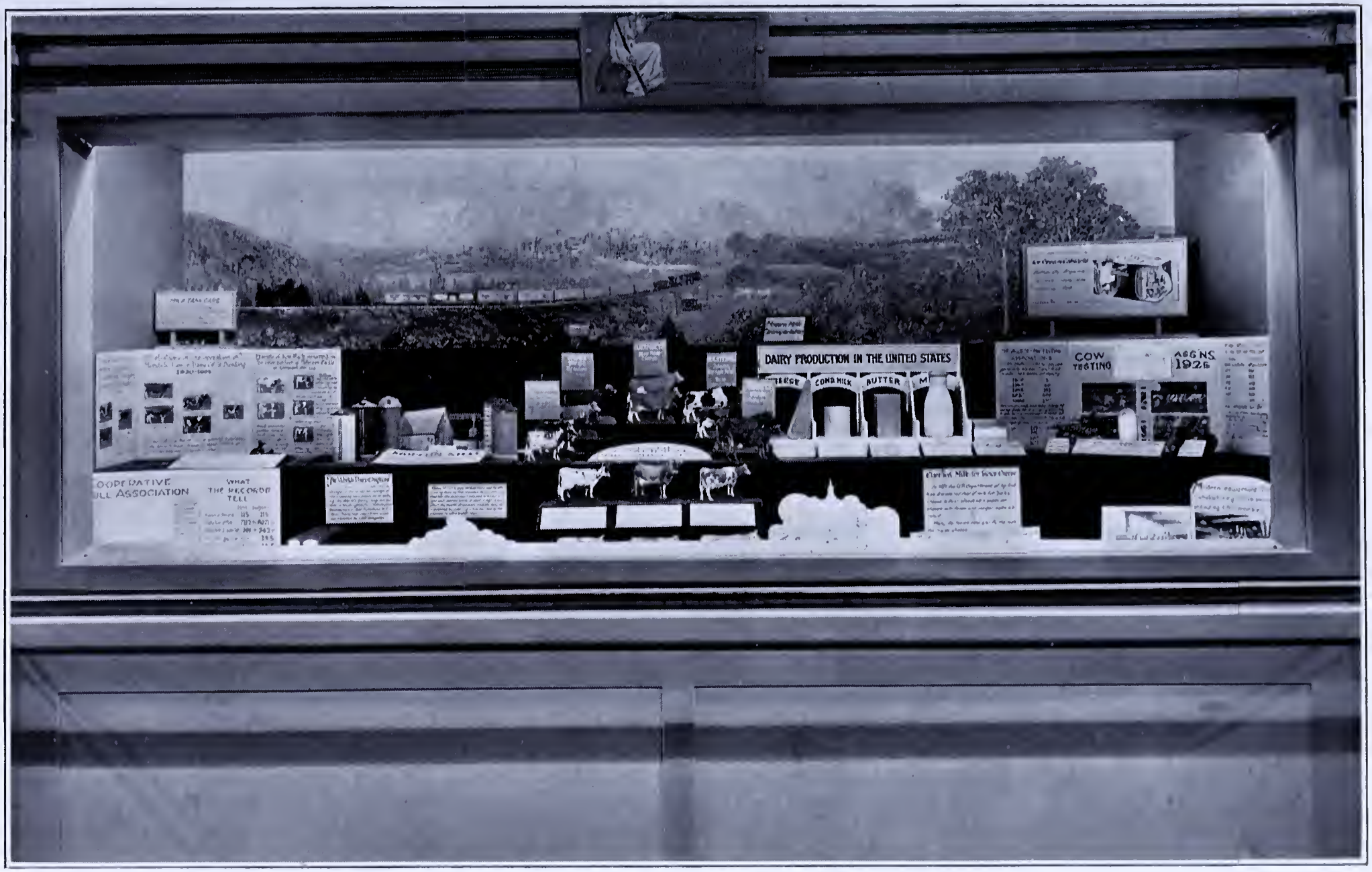

PLATE 188.—Progress in Dairying, 1921-1925.

feet long, 4 feet wide, and 8 feet high. Each case depicted the progress of dairying during a five-year period. (Plates 186, 187, and 188). The backgrounds of the cases were paintings representing landscapes and scenes that also showed dairy development and were typical of the period represented. The exhibits—numbering 173—were of various styles. Some were miniature models of the machine or article developed; others were photographs mounted and cut to make them stand out; still others were colored illustrations of the article or person concerned in the development. An appropriate legend gave the historic facts about each exhibit.

The advancement in dairy science and improvement in practice recorded in this exhibit could not have been made but for the assistance received from various educational institutions. One of the most important of these was the dairy school, the first of which was organized at the University of Wisconsin. Other important institutions were the national organizations of creamery, milk, cheese, ice cream, and dairy workers, and the dairy press. The first strictly dairy farm paper was published in 1885 in Wisconsin by W. D. Hoard.

In describing the contents of the exhibit cases each subject is discussed in relation to its development throughout the period covered by the whole exhibit rather than touching upon it in connection with the subject-matter in the individual cases.

IMPROVEMENTS OF DAIRY CATTLE

Dairy-Herd Improvement. The various dairy-cattle registry associations have played an important part in the improvement of dairy cattle. In the display representing the first period, 1876-1880, reference was made to the organization in 1868 of the American Jersey Cattle Club, which was incorporated in 1880. The Ayrshire Breeders' Association, the American Guernsey Cattle Club, and the Brown Swiss Breeders' Association were all organized in that period. The associations of the breeders of Holstein and Dutch cattle, organized in 1871 and 1877 respectively, were combined with the Holstein-Friesian Association of America in the second period, 1885. During that period also the Dutch Belted Cattle Association and the Red Polled Cattle Club of America were organized.

It was during the first period that the American Jersey Cattle Club adopted its first score card for Jersey cows, but the score cards for the Holsteins, the Guernseys, and the Ayrshires did not appear until the second period, 1801-1886. These score cards have been used as a standard for breeders and judges in the show ring.

It is interesting to compare the conformation of the champion dairy animals at early fairs with those of the present day. In the first

period case the champion Jerseys at the Centennial in 1876 were shown. These were three cows of the prize-winning herd. The champions at the World's Columbian Exposition, 1893, were shown in the fourth case representing the period 1881-1895. They were the Sweepstakes Jersey bull; Sweepstakes Holstein bull; champion Guernsey bull and cow; and the champion Ayrshire bull and cow. In the case for the period from 1901-1905 the champions at the St. Louis Exposition were shown as cut-outs. These were the bull and cow of the Jersey, Holstein and Guernsey breeds. In case seven 1906-1910, the grand champions at the National Dairy Show for 1910 were shown. These included a bull and a cow from each of the five breeds: Ayrshire, Brown Swiss, Guernsey, Holstein and Jersey. The same were given for the champions in 1914 in case eight; the champions in 1920 in case nine; and for 1925 in case ten.

Better-Sire Work. The introduction of better sires, especially pure-breds, has had a great influence in dairy-herd improvement. Small herds as a rule are not headed by the best bulls. Through cooperative ownership high class bulls become available for small herds at low cost. The first cooperative bull association was organized in Michigan in 1908. There has been a steady growth of these organizations until in 1926 there are 225 such associations in the United States.

Breeding Theories. The effect of the discovery of various theories and laws of inheritance to dairy-cattle breeding is not well known. The exhibit showed that in 1889 Sir Francis Galton, who was a grandson of Erasmus Darwin and cousin of Charles Darwin, published "Natural Inheritance."

Galton's theory of ancestral inheritance is that "the parents together contribute one-half the total heritage, the four grandparents one-fourth, the eight great-grandparents one-sixteenth, and all the remainder of the ancestry one-sixteenth."

Results of experiments performed by Mendel in 1865, but not generally known until 1900, case five, provide a more accurate interpretation of the law of ancestral inheritance.

In 1865, Greger Johann Mendel, an Austrian monk, published results of crossing varieties of the garden pea and derived the law which bears his name.

The operation of Mendel's law as applied to dairy cattle is shown in case ten, the last period, by the following examples: First, how solid color is dominant over spotting in Jersey cattle; second, how the recessive spotting in Jersey cattle always breeds true; and third, how black occurring in the color pattern of Holstein cattle is dominant over red.

Livestock Judging: Another factor that has played a part in the improvement of dairy cattle is that of livestock judging. Class-room instruction in judging dairy cattle was first introduced in 1891 at the University of Wisconsin by John A. Craig, first professor of animal husbandry in the United States. The first Students' National Dairy Cattle Judging Contest was held at the National Dairy Show at Chicago in 1907.

Records and Testing. The earliest records showing the annual production per cow in the United States are based on the 1880 census, which gives the average at 2,003 pounds of milk. This was increased to 2,709 pounds as shown by the 1890 census; to 3,646 pounds according to the 1900 census; 3,113 pounds in 1910; and 4,368 pounds in 1924. The improvement was steady. It was given considerable impetus in 1891 when the Babcock test was invented. The first tester in use was shown in case four. Previous to 1890 the Oil Test Churn was used as a means of determining the amount of butterfat in milk and cream. Before 1885 the farmer was paid the same per quart or pound of milk regardless of its richness. The application of the Babcock test to herd improvement has been a factor in increasing the average production per cow. Individual farmers have tested their cows and kept records of the feed. Organizations called cow-testing associations have been formed for this purpose and have also been a factor in increasing production. The first cooperative cow-testing association in the United States was organized in Newaygo County, Michigan, in 1906. These associations are composed of about 26 farmers who cooperatively hire a person to weigh the milk and feed for each cow, and test the milk for butterfat once a month. In 1926, 777 of these associations were in operation.

Dairy Production Champions. The exhibit showed that great improvement has been made in the production of our best purebred cows. In the period 1896-1900, the milk production champions are shown: Holstein, *Belle Sarcastic*, record completed March 3, 1897, with a production of 23,189 pounds of milk and 721 pounds of butterfat; Jersey, *Dollie's Valentine*, record completed February 24, 1889, with a produc- of 10,218 pounds of milk and 578 pounds of butterfat.

The official testing of purebred dairy cows for recording in the Advanced Registry or Register-of-Merit, was adopted for the Holstein in 1900; Guernsey, 1901; Ayrshire, 1902; and Jersey, 1903.

In the next 5 year period, 1901-1905, the milk champions were as follows: Jersey, *Emma's Rowena*, with a production of 10,383 pounds of milk and 638 pounds of butterfat; Holstein, *Belle Sarcastic* still held the championship; Guernsey, *Yeksa Sunbeam*, finished her record October 21, 1905, with a production of 14,920 pounds of milk and 857 pounds of butterfat.

During the next period 1906-1910, there were three new champions, Guernsey, *Dolly Dimple*, with a record of 18,458 pounds of milk and 906 pounds of butterfat; Holstein, *Colantha 4th's Johanna*, with a record of 27,432 pounds of milk and 998 pounds of butterfat; Jersey, *Jacoba Irene*, with a record of 17,253 pounds of milk and 952 pounds of butterfat.

Another complete change was noted in the period 1911-1915. The Ayrshires showed their first champion in *Hetherall Brownie 9th*, with a production of 18,110 pounds of milk and 820 pounds of butterfat. The champions for the other breeds were as follows: Guernsey, *Murne Cowan*, with a production of 24,008 pounds of milk and 1,098 pounds of butterfat; Holstein, *Dutchess Skylark Ormsby*, also champion of all breeds, with a production of 27,761 pounds of milk and 1,205 pounds of butterfat; Jersey *Sophie 19th of Hood Farm*, with a production of 17,557 pounds of milk and 999 pounds of butterfat.

In the period 1916-1920, the Holstein champion butterfat producer remained the same. The Ayrshire was *Lily of Willowmoor*, with a record of 22,596 pounds of milk and 955 pounds of butterfat; Brown Swiss, *College Bravura 2nd*, with a record of 19,460 pounds of milk and 798 pounds of butterfat; Guernsey, *Countess Prue*, with a record of 18,626 pounds of milk and 1,103 pounds of butterfat; Jersey, *Plain Mary*, with a record of 15,256 pounds of milk and 1,040 pounds of butterfat. The milk production champion of all breeds was shown to be the Holstein cow, *Segis Pietortje Prospect*, with a record of 37,381 pounds.

The tenth and last case, representing the present time, showed the same champion for the Ayrshires as was shown in the preceding period. The other breed champions were as follows: Brown Swiss, *Believe*, with a record of 25,847 pounds of milk and 1,002 pounds of butterfat; Guernsey, *Anesthesia Faith of Hill Stead*, with a record of 19,741 pounds of milk and 1,112 pounds of butterfat; Holstein *DeKol Plus Segis Dixie*, with a record of 33,464 pounds of milk and 1,349 pounds of butterfat; Jersey, *Darling's Jolly Lassie*, with a record of 16,425 pounds of milk and 1,141 pounds of butterfat.

Cooperative Bull Associations have increased production in their herds to a remarkable degree. The records of the daughters of bull association bulls, compared with the records of the dams of the daughters, show a gain of daughters over dams of 13.5 per cent in milk production and 14.6 per cent in butterfat.

FEEDING STANDARDS

Dairy-Cow Nutrition. The increase in the production of our dairy cattle, as noted in the previous description, has probably been due in a

large part to the introduction of better feeding practices. Between *1876* and *1880* the Wolff Standard was used as a guide for feeding dairy cows. It was introduced into America by Atwater and Armsby. This was a good approximation to the protein and digestible nutriment required by milking cows, but it prescribed only for the production of milk having the average butterfat content.

The exhibit in case seven, 1906-1910, showed that between 1906 and 1911 Haecker and Eckles were working on the nutriment required for milk production. They fed dry cows and milking cows enough to keep them at uniform body weight and kept accurate records of the feed eaten, also of the milk and butterfat produced. In this way they were able to calculate how much nutriment was needed to produce a given amount of milk with a given butterfat content.

Between 1911 and 1916, Haecker, Eckles and Savage published feeding standards for milk production. Their results in regard to the nutriment required for milk production were in close agreement.

Between 1916 and 1921, Hart, Forbes and others worked on the chemical nature of the feed required by dairy cows. Hart showed that cows could not be made to reproduce normally on rations made up of wheat and wheat straw though these contained plenty of digestible nutriments and protein. Forbes showed that milking cows fed rations that contained plenty of digestible nutriment and protein were likely to be losing large amounts of calcium in their bodies.

In the last case an exhibit shows that between 1921 and 1926 important work was done by Hess, Steembock, Hart and others, showing that ultra-violet rays may have an important effect on the health of animals. These rays are contained in direct sunlight and may be produced artificially by certain kinds of electric lights.

The silo has been an important factor also in improving dairy-cattle rations. The first case showed an exhibit of canned feed for cattle. This kind of feed was used long before 1875, but the first silo in which it was stored in the United States was constructed in 1875. This was in form of a trench or pit and was used to store and preserve chopped green corn. The first trench silo in the United States was constructed by Mr. Manly Miles at Champaign, Ill., in 1875. A square wooden silo was built in Wisconsin in 1880.

During the years 1886-1890 the silo was in transition from the pit and trench to the square and rectangular above-ground silos, and finally to the octagonal and round types common today. The next advance was to increase the height of the silo, thereby making it unnecessary to use weights to compress the silage. Modern silos are generally cylindrical in shape. They are built of wood, concrete, hollow tile, cement block,

cement stave, steel, metal lath and plaster, brick and other materials. In 1918 the estimate of the number of silos in this country was 404,000.

MILK PRODUCTION

Milk Production. The improvement in market-milk has been steady and rapid. The first mechanical milkers were tried as early as 1819. During the period from 1876-1880, three types of milkers were in use, namely, milk tubes, pressure machines, and suction machines. The modern machines are based largtly on the suction type.

The first power-operated pipe-line milker with pulsator was put on the market during the period 1901-1905. The invention of the pulsator was the outstanding feature. It made possible the production of intermittent suction.

During the period 1916-1920, four groups of mechanical milkers were in use, namely, foot power, pipe line, drive rod and portable motor. Nearly all pipe-line milkers use inflation-type teat cups, and all have pulsators, while drive-rod milkers have noninflation-type teat cups and no pulsator.

Our present day milk ordinances had their beginning as far back as 1856 when the first known milk law in this country was passed by the General Court of Massachusetts. It was directed against the adulteration of milk by skimming or watering.

In 1908 Chicago passed a law requiring pasteurization of all milk and cream from cows which had not passed a test showing that they were free from tuberculosis. This was the first compulsory pasteurization law in the United States.

MARKETING MILK

Market Milk. Beginning about 1876 there was a growth in the population of our cities which created an increased demand for milk. This made it necessary to transport milk by rail for greater distances than previously, for the reason that not enough milk was produced in the immediate vicinity of cities to furnish the supply needed.

In the cities milk was delivered to consumers in cans and dipped out into open vessels. The glass milk bottle, however, was an important sanitary measure which was used as early as 1878 for delivery of milk. The Thatcher bottle invented in 1886 brought glass milk bottles into wider use. Then came the "Common Sense" bottle patented in 1889. It was similar to the present bottle, having a shoulder to receive a fiber disc or cap. During this same period, 1886-1890, the first milk bottle filler was patented by Dr. Stone. Prior to this date milk was prepared for delivery to consumers in a very unsanitary manner. Where bottles were used they were filled by hand.

In 1888 Soxhlet's sterilizer in which milk for infants was heated in special bottles was introduced in the United States from Germany. These bottles made possible effective pasteurization of milk and at the same time measured the quantity needed for the infant.

Soon after this, in 1893, Nathan Strauss, of New York City, installed milk depots, so as to make pasteurized milk available for sick and undernourished children. It was during this time also that the first certified milk was produced at Fairfield Dairy, Essex County, N. J., by Stephen Francisco. Dr. Henry L. Coit originated the idea and coined the phrase "certified milk" in 1892. The production of certified milk pointed the way to better dairy sanitation and to the importance of clean milk.

As an aid to producing clean milk, a dairy-farm score card was devised in 1904. Sanitary methods and equipment were thus mathematically rated. This made dairy inspection more uniform and promoted clean milk production.

Later, in 1906, the first milk and cream contests were held at the National Dairy Show. Scoring was based on the flavor, richness, number of bacteria, and appearance of package of each sample. This was the beginning of mathematical standards for milk based on sanitary and commercial qualities.

Similar contests but with the "surprise" feature were held in 1911. Samples were collected from dairymen without warning. These contests are still used as a basis for grading milk in many cities.

Owing to lack of knowledge of how feed flavors are imparted to milk and the means of preventing this, experiments were started in 1920 by the U. S. Department of Agriculture. Some had thought that absorption from the air was the chief cause. It was found, however, that most feed flavors and odors pass through the body of the cow into the milk. They pass very rapidly, sometimes in one minute. They remain in the body and are imparted to the milk for several hours. Objectionable feed and weed flavored milk causes heavy losses to dairymen. Such feeds should be given immediately after or several hours previous to milking.

Market-Milk Equipment. The coming into use of the glass milk bottle created a demand for a quick method of cleaning bottles. The first steam turbine bottle washer came on the market about 1895. Prior to this milk bottles were washed by hand with a brush or a rag tied to a stick.

Both bottle washers and can washers of the soaker type came into use between 1901 and 1905. During this period also the can rinser and steamer were first used.

The jet can washer, in which washing solutions and rinsing water are forced into the cans through jets by means of powerful pumps, was first manufactured about 1911. In this machine the cans were dried with hot air after being washed.

The rotary type of the jet can washer was first used about 1915, Modern bottle washers of the soaker type, where bottles are soaked for several minutes in strong alkali solution before being washed, were shown in the last case, 1921-1925. In these bottle washers bottles were rinsed, sterilized, cooled, and then automatically passed on to the bottling machines for filling.

Equipment that has played an important part in the production of better milk includes: The small-top milk pail invented by H. B. Gurler of DeKalb, Illinois, in 1896; the surface milk cooler which came into use in 1892; milk filters in which milk was made to pass through several thicknesses of cheesecloth or absorbent cotton and which came into use between 1896 and 1900; and the milk clarifier which appeared for the first time during the period 1906-1910.

There has been a gradual development of the city milk plant and a consistent demand for machinery for handling milk in these plants. One of the first pasteurizers was designed by H. L. Russell of Wisconsin in 1895, and a Danish type of this machine was introduced into the United States the same year. Another pasteurizer known as the Potts, came out in 1898, and during the period from 1901-1905 several new types of pasteurizers were brought into use. One of these was the regenerative pasteurizer and another was the Farrington. The latter is a continuous flash pasteurizer which not only heats the milk or cream but also cools it. Still further improvements in pasteurizers were noted in the case representing the period 1906-1910. Among these may be mentioned the tubular type and the improved regenerative, having the holder feature added. The holder pasteurizer of the pocket type was also introduced at this time.

A development of the arrangement of milk plants was likewise shown. During the period from 1911-1915, the pasteurizing and bottling equipment included hand case fillers and cappers with the plant arranged on a gravity basis. Five years later, 1916-1920, the modern milk plant showed three floor levels. The top floor is used for receiving vats, and from these milk flows over a surface heater to three pasteurizing vats on the second floor. Then it passes over a surface tubular cooler to the automatic filling and capping machines located on the first level. The empty bottles come in and the filled cases go out on a roller conveyor.

Other improvements in market-milk equipment include the glass-lined tanks, which were introduced in 1906-1910; rotary milk-bottle fillers and cappers were introduced in 1911; the tank truck for transporting milk was first used in 1914; glass lined tanks used for pasteurizing came out during the period 1916-1920; and milk tank cars came into use in 1925. All of these improvements have been a forward step in the elimination of labor and in making it possible to deliver better milk to the consumer.

BUTTER MAKING

Butter Making. Previous to 1875 the factory system of butter making had been in operation about 14 years; and while the dash churn was still the favorite type, the revolving box and barrel churns were also used. Much of the butter was made on the farms, but in some localities milk from the neighboring farms was taken to the creamery and placed either in large, shallow pans or in "deep setting" cans immersed in spring water. The cream was skimmed off by hand, and the butter was also worked by hand.

The idea of using centrifugal force for skimming was first recorded in Germany in 1860. The first machines consisted of pails attached to a revolving disc.

The continuous flow cream separator was invented in 1877 by Gustaf DeLaval of Sweden. Its capacity was about 300 pounds of milk an hour.

From 1886-1890, one of the first complete creamery plants was assembled. This provided for a gravity system where the milk was received on a higher floor level, then flowed by gravity to the separators on the second floor level, then directly into cream ripeners, and finally to the churns located on the third floor level. One large steam engine operated all of the equipment.

The hand cream separator also came into use during this period.

The combined churn and butter worker was invented in 1893. It proved successful and soon after that time this became a standard type of equipment in creameries. Such churns reduced the labor incident to butter making and made it possible to produce better and more uniform butter.

Up to this time creameries had been community institutions, but since the volume of milk in many communities was not sufficient to support a creamery, the idea of sending the cream to a central churning point was suggested. The first plant of this kind on record was at St. Albans, Vermont, and operated between 1891 and 1895. Its cream supply was separated at skimming stations, the cream alone being sent to St.

Albans, a central point for churning. This was the first "centralizer." The system was soon adopted in the Middle West, and later when the hand separator became widely used the skimming station became a cream station.

Other improvements in the butter-making industry include the development of machines for making one-pound prints. These machines were first used in 1896-1900. The process of paraffining butter tubs, begun in 1901-1905, was another improvement. Many creameries suffered severe losses because of mold growth on butter shipped to market in tubs. Doctor Rogers of the U. S. Department of Agriculture demonstrated that coating the inside of the tub with paraffin largely prevented mold growth.

The butter moisture test was invented in 1906. The three methods developed about the same time were the Gray, the Irish, and the Farrington.

In 1906 the U. S. Department of Agriculture demonstrated that butter made from pasteurized sweet cream would not deteriorate to any great extent in cold storage, even when held for several months. In 1908 the Roosevelt fleet took sweet cream butter on its trip around the world. This butter was still good when the fleet returned. This was the first sweet cream butter the United States Navy had used. Since that time the Navy has used sweet cream butter every year.

From the beginning of the creamery system of making butter in the United States the cooperative farmer-owned plants have been important. By 1911 they were well established and their operation was widespread. In general they receive cream from only nearby farms and have therefore attained notable success in the manufacture of high grade butter.

CHEESE MAKING

Cheese Making. One of the first improvements noted in commercial cheese making was the supplanting of homemade rennet by a commercial rennet extract of standard strength, introduced into the United States about 1877, which made it possible to manufacture a uniform product and to save much time and labor. In 1889 Decker of Wisconsin and in 1891 Doane of the Department of Agriculture experimented with the paraffining of cheese. They found that this practice reduced shrinkage and checked mold growth in curing.

Until 1895 no careful study had been made of the best curing temperature for Cheddar cheese. Babcock and Russell, 1895-1903, demonstrated the value of low instead of high curing temperatures for cheese. This resulted in fewer mechanical holes, improvement in flavor and texture, and reduction of shrinkage.

The introduction of the Wisconsin curd test in 1895 gave a means of determining quality of milk for cheese making. The same year the use of lactic-acid starters for making cheese made it easier to check gassy fermentation and to improve the flavor and texture.

From 1907-1913, experiments conducted by the Wisconsin Experiment Station and the U. S. Department of Agriculture resulted in a method of making Cheddar cheese from pasteurized milk.

In 1917 the bulgaricus culture was used regularly in the manufacture of Swiss cheese. This organism was isolated in 1910 by Doane and Eldridge of the U. S. Department of Agriculture. The bulgarican culture checks gassy fermentations and lessens other abnormal fermentations.

Bacteriologists have vainly endeavored to isolate the organism responsible for the eyes and flavor of Swiss cheese. In 1918 a special culture was made from the eye and flavor forming organism which was isolated by Dr. Sherman of the U. S. Department of Agriculture. This culture, known as Culture No. 62, was first used in a field trial in 1918. The following year it was being used regularly with good results at the Grove City Creamery, Grove City, Pa.

In 1921 the U. S. Department of Agriculture discovered that if milk for Swiss cheese is first clarified a cheese of superior quality with fewer and larger eyes will result. Many factories in the United States, especially in Wisconsin and Ohio, now clarify the milk for Swiss cheese.

Other cheese which came into more general use about the time of the World War were cottage cheese made from surplus skim milk, and process or loaf cheese. The latter was made by a special process whereby cheese, such as Cheddar or Swiss, was ground, heated, stirred, and molded into blocks. Each loaf was wrapped in tin foil and marketed in suitable boxes. Such cheese gives a convenient package with no loss of rind and very little loss of spoilage.

Roquefort cheese was successfully made from cow's milk by a method worked out by the U. S. Department of Agriculture and developed on a factory basis in *1919*.

MISCELLANEOUS PRODUCTS

Other Dairy Products. In 1876 ten million pounds of condensed milk was made in the United States by a process invented by Gail Borden in 1853. Evaporated milk was first successfully manufactured under the Mayenberg process in this country on June 15, 1885, at Highland, Ill.

The process of making malted milk from malted barley, wheat flour, and whole milk was perfected in 1883 by William Horlick.

Ice Cream. Several improvements in ice-cream equipment were noted during 1901-1905. The old tub freezer was equipped with a circulating brine system in place of the ice and salt. Brine was made in a separate tank kept at the proper temperature and was circulated through the tub by means of a pump. It was designed by E. Walker of Warren, Pa., about 1901. The first horizontal circulating brine freezer came out in 1902. It was designed by H. H. Miller of Canton, Ohio. During this period also the old method of hardening ice cream by the usual salt and ice method in tubs was displaced largely by a method of hardening the ice cream in brine tanks, the brine being kept at the proper temperature by means of immersed ammonia pipes. This was also originated by E. Walker of Warren, Pennsylvania.

The homogenizer is a machine which breaks up the fat globules in milk and cream by forcing them between agate or metal discs at an extremely high pressure (about 2,000 lbs. to the square inch). This machine was first used in an American plant about 1908. It improved the consistency and viscosity of cream. Homogenization for improving the texture of ice cream was first tried by Arthur Chapin at Washington, D. C., in 1910.

The modern ice cream plant as shown in the last period shows a battery of horizontal brine freezers on one floor level with conduits carrying the frozen product to a room beneath where the automatic filling machines are operated by a corps of workers. The empty cans are conveyed on an endless chain from one cold storage room, under the filling hoppers, and back into the hardening room. The forms for bricks are filled under one hopper and the cans under another.

By Products. The process of manufacturing milk sugar was developed in the United States in 1892. Milk sugar is used in infant foods, as a binder in pills, and in acidophilus milk.

Casein was first used for coating paper about 1896. Paper waterproofed with casein is used in cartridge boxes, washable wall papers, paper garments, colored, art and transfer papers, and paper flasks.

In 1925 over 500,000 pounds of casein was used in making casein spreaders, which are used with sprays, such as lead arsenate. When no spreader is used the spray collects on the fruit or leaf in drops; but when sprayed with lead arsenate containing milk casein spreader, the spray appears as a film covering the whole surface of the leaf and fruit.

Another by-product of milk is casein plastics. Its use began about 1923. Over 500 kinds of casein plastics are in use today. This material can be dyed, is tasteless, odorless, and noninflammable. It tools easily, can be embossed, has high tensile strength and is a good electric insulator. Combs, buttons, pencils, and pen holders are samples of casein plastics.

Dairy Bacteriology. It was known that the quality of dairy products was affected by bacteria, but their action was not understood and there was no known way of controlling them. The first systematic work on dairy bacteriology in this country was done by Dr. Conn at Wesleyan University in 1892. This work included a study of pure cultures for butter making and cheese making.

Bureau of Entomology

The Bureau of Entomology had as a setting for its exhibit of insect pests a model of a brightly colored farm scene with a group of modern farm buildings in the middle distance, a truck garden on the right and on the left fields of corn and wheat, beyond which was an apple orchard. In the immediate foreground was a small pond, an ideal place for breeding mosquitoes. A sign by the roadside on the left concealed an automatic projector that displayed colored lantern slides illustrating important insect pests of various farm and garden crops, orchard pests, disease carrying insects, etc., and also a number of activities of the Bureau.

Bureau of Home Economics

Homemaking, Food, Clothing, the use of time by homemakers, and kitchen planning, together with the methods used by the U. S. Department of Agriculture in finding and sending out scientific facts on those subjects, were the general topics dealt with in the exhibit of the Bureau of Home Economics.

Home Economics. The work of the Bureau itself was typified as "a plant that generates and transmits a current of scientific facts to the homemaker." The inner workings of this plant appeared in a series of views of its laboratories and illustrations of other means by which it obtains these facts on homemaking. Letters, bulletins, scientific articles, press notices, and radio releases were listed as carrying these findings to the farm homes represented on an enlarged map of the United States.

Food and Health. This was a three panel booth on the center panel of which, under the admonition "Watch for the signs of good and poor nutrition on the road to health," were lists of the signs or indications in brief popular terms of good and poor nutrition. The foods a person needs in order to insure good nutrition were listed by five groups on the left hand panel along with a brief statement of what each group supplies the body. For instance, fruits and vegetables headed the list, followed by the statement, "These supply minerals, vitamins, and 'roughage' necessary for normal growth and health." The food needs of different persons were shown in graphic form on

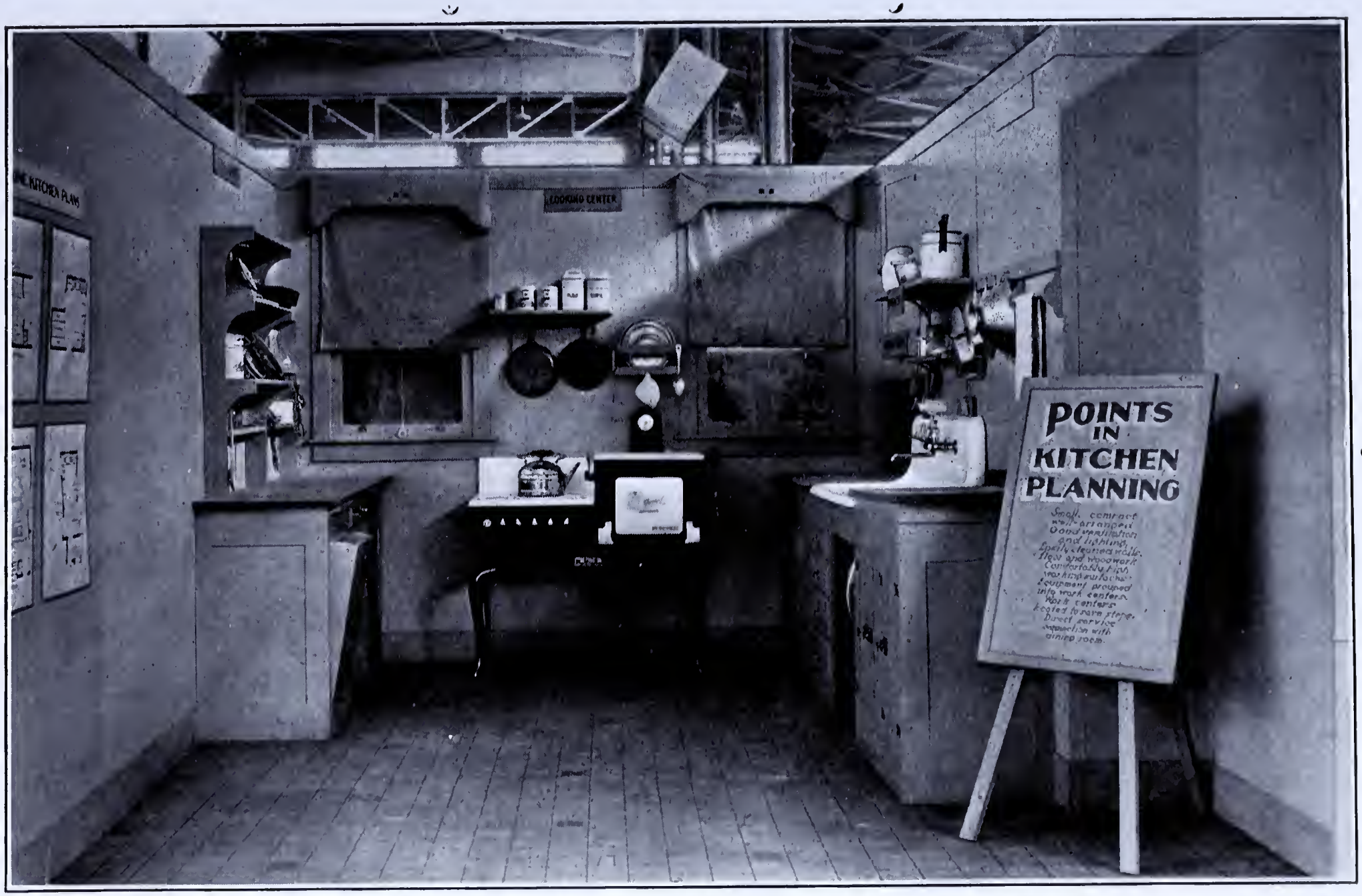

PLATE 189.—High points in kitchen planning involve convenient work centers for the preparation, cooking, and serving of food. The kitchen is the homemaker's laboratory.

the right hand panel as another of the important points in the relation between food and health.

Balanced Diet. This exhibit translated the food facts shown in the "Food and Health" booth into terms of balanced diets for a family of five. In a case resembling a cupboard and refrigerator with glass doors, were displayed the food supplies for such a family for a day in summer and for a day in winter.

Home Canning. The hot-pack method of home canning fruits and vegetables was described and illustrated in a three panel booth by enlarged, colored pictures. Every step from the preliminary cooking of a fruit and a vegetable through the packing, sealing, and processing, to the final cooling of the jars and cans was included.

"Homemaker's Day," "Clothes" and *"Family Clothing."* These subjects were combined in an extended booth exhibit consisting of panels and mechanically operated apparatus.

"Clothes," the right and wrong kind, for children and women of different ages and types, were illustrated on miniature figures on a revolving stage. As each pair of figures appeared, legends in dialogue were thrown on a screen just above the figures. The legends called attention to the outstanding features in the costumes. In this way 14 educational points were brought out on clothing selection and costume design as regards economy, suitability, wearing qualities, and attractiveness.

Family Clothing. The value of a clothing budget and of careful laundering, frequent cleaning, and prompt removal of stains was shown on panels. Data indicating how farm and industrial families divide their clothing expenditures among various members of the family were represented in graphic form as a basis on which to build a clothing budget.

Homemaker's Day. Under the heading, "Around the clock with the homemaker," were given records of the time spent by a group of farm women in food preparation, care of house and equipment, sewing, laundering, care of children, and all the other household and personal activities that filled up their days for a week. Charts also showed how a city and farm homemaker with four children in the family used their time during the week. Cornucopias filled with gold pieces on each side of an illuminated clock face suggested that "time is money" for the homemaker as well as any other group engaged in productive work.

"The Homemaker's Kitchen." A kitchen with work centers equipped and conveniently arranged in relation to each other, illustrated the high points of kitchen planning. (Plate 189). The walls and woodwork were of simple construction and painted a warm tan and gray. The floor was covered with excellent quality inlaid linoleum of the same

PLATE 190.—General View—Bureau of Plant Industry exhibit.

general tone but with bits of bright color in the pattern. These same gay colors were repeated in shades and valances of oilcloth at the windows, and in mixing bowls and other small pieces of equipment. In this way it was demonstrated that though walls, woodwork, and floor should have a durable, easily cleaned finsh, and though equipment should be chosen primarily for use, at the same time the kitchen may be made an attractive workroom. Floor plans of four other kitchens of various types were displayed on one of the walls and the points in kitchen planning were summarized on a placard.

Bureau of Plant Industry

The Bureau of Plant Industry exhibit (Plate 190) consisted of portrayals of such Bureau activities as lent themselves to interesting and attractive display including suggestions and illustrations of the nature of the activities rather than detailed descriptions of all the phases of the investigational work. Show cases, screens, transparencies and mechanical devices were utilized in the presentation of specimens, models, charts, graphs, photographic reproductions and statistical data. The entire collection was open to view, there was nothing enclosed within booths.

Effect of Day-length on Flowering Plants. Many kinds of plants flower only during a certain period of the year, this seasonal flowering being caused mainly by natural variation in the length of day. The highly technical study of plant growth as influenced by the length of day was exhibited by special apparatus whereby day length was artificially produced and controlled for the study of short and long day plants. A Cosmos was selected as representing the "short day" and a Rudbeckia represented the "long day" plants. Supplementing these growing plants were panels of colored photographs, one illustrating many short day, the other long day plants grown experimentally under similarly controlled conditions.

Fruit Varieties. Three glass top display cases contained models in wax of apples, peaches, pears, and plum varieties; and citrus and sub-tropical fruit varieties. Such historical data as were available accompanied each model. These models and data representing commercially important fruit varieties attracted much attention from visitors.

Fruit Diseases. Supplementing the pomological exhibits were three panels of colored photographic enlargements illustrating investigations and results in the control of apple, peach, pear, grape, berry, citrus, and sub-tropical fruit diseases.

Nut Culture. The nut display included the principal varieties of leading or potential importance in the United States such as pecans, Persian (English) walnuts, almonds, filberts, black walnuts, and a va-

riety of Chinese chestnuts resistant to the destructive chestnut blight disease.

Blueberry Culture. A panel of colored natural size and enlarged bromides illustrated the improved blueberries developed by the Bureau of Plant Industry and now produced commercially. There were also suggestions for the successful cultivation of acid-soil plants such as arbutus, laurel, rhododendrons and azaleas by the use of aluminum sulphate fertilizer.

Wheat: Wheat Smut and Rust: Barberry Eradication. These subjects were treated by displays of specimens, text and charts in glass cases. The wheat case contained head specimens and seed samples of important varieties of wheat and varieties important for breeding and selection experiments. Smut and rust diseases of wheat, barley, oats, corn, sorghum, timothy and flax were illustrated by head specimens with disease control data.

Barberry eradication and control of black stem rust of wheat and of other cereals and grasses were presented by the use of magnified colored transparencies and plant specimens. These illustrated the life cycle of this disease.

Oats, Barley, Rice. Principal varieties of oats, barley and rice were shown by means of actual plant specimens in a glass case with appropriate labels and text.

Corn. Three glass display cases were devoted to corn types and varieties including white dent, yellow, and red dent, flint, flour, and important sweet corn. Average ears rather than show types were collected to represent the various groups. Methods of corn culture and seed corn selection were illustrated by colored bromide enlargements.

Disease Resistant Corn Breeding. The Indiana Agriculture Experiment Station cooperated in the preparation and presentation of an exhibit demonstrating approved methods of corn breeding for disease resistance. By inbreeding corn plants true breeding strains of decreased vigor are obtained. Disease resistant strains are selected from these; combined and re-combined for uniformity and increased vigor.

Seed Importation. Aided by the use of magnifying glasses, the recently amended Seed Importation Act was illustrated. Alfalfa and red clover seed colored to protect seedsmen as well as farmers from seed from undesirable sources were displayed in a flat glass case.

Seed Purity. Seeds and seed adulterants with illustrations of methods and care used by the Department in protecting the farmer from imported and domestic seed of low vitality, from seed adulteration, and in preventing the introduction of objectional weed seeds were shown by means of specimens. A world map showed the principal sources of imported farm seeds.

Soy Bean. The importance of the soy bean in American agriculture was emphasized in a case displaying the wide range of size, color, and adaptability of this crop. Its usefulness in food, feed, industrial products and by-products was shown.

Alfalfa, Clover, Vetch, etc. Another case was devoted to such important forage crops as alfalfa, clovers, cowpeas, vetches, etc. Crop rotations are incomplete without legumes. The best adapted and most important leguminous forage crops for various agricultural regions of the United States with suitable cultural notes were presented in this exhibit.

Sorghums. Nine of the most important grain and forage sorghum varieties produced in the semi-arid Great Plains represented this important crop to the production of which some 10,000,000 acres are devoted.

Crop Plant Diseases. Screens upon which were mounted colored bromide enlargements illustrated potato and tomato diseases. "Running out" of potato was shown to be a matter of disease of mosaic, spindle tuber and other types conveyed in the seed tubers. Potato success depends largely upon the use of disease-free tubers from carefully inspected fields, seed treatment and spraying. Tomato wilt, blight and septoria leaf spot were also shown, together with the use of disease resistant strains and clean cultivation as control measures. The potato and tomato disease displays were, of course, mere suggestions of the wide field of Bureau activities in crop plant disease investigations.

Soil Fertility. A graphic illustration of the field method of experimentation to determine proportionate amounts of nitrogen, phosphorus and potash necessary to produce maximum crop yield from different soil types was presented in one case, with supplementary field and laboratory lantern slide views of soil fertility experiments with various crops automatically projected by a balopticon. In another case were exhibited comparative yields of wheat and cotton from concentrated fertilizer experiments.

Cotton. A cotton exhibit in a tall glass case illustrated the value of selected seed stock as against gin run seed, also superior cotton varieties developed by the U. S. Department of Agriculture. Comparative length of lint of extensively grown cotton varieties and cotton pulls showing long and short staple lint lengths were also shown.

Fiber Plants. Important fiber plants such as sisal, hemp, flax, etc., steps in the production of the fiber and a few manufactured products, cordage, rope, binder twine, commercial hemp twines, Oregon flax twine for shoe threads and fish nets, and Michigan flax used in the manufacture of course fabrics for automobile tops were exhibited with appropriate labels in both sides of a tall glass case.

PLATE 191.—General View—Public Roads exhibit in foreground—Biological Survey exhibit on right.

Tobacco Culture. A panel of colored enlargements illustrated culture, harvesting and curing of tobacco while in a nearby case were samples of the physiological effect of fertilizers upon tobacco plant growth and cured leaf, also the more important tobacco plant diseases.

Cigar Testing Apparatus. This was an ingenious apparatus designed to demonstrate testing the burning quality of good, medium and poor grade cigars. Four cigars were automatically smoked at one time, the intervals between "puffs" being timed for average smokers.

White-pine Blister-rust Control. A case exhibit illustrated the life cycle of white pine blister rust, its method of spreading and extent of damage in eastern and western white pine areas. Actual log specimens, diseased current leaves, colored transparencies and enlarged photographs told in considerable detail the story of current and gooseberry eradication methods by which this damaging disease is controlled.

American Bulbs. Achievements in the production of American grown lily, tulip, hyacinth and narcissus were shown in a panel of oil colored photographic enlargements.

Rose Culture. The popular rose varieties produced by Dr. Van Fleet and rose types from the U. S. Department of Agriculture rose gardens were illustrated on companion panels by photographic reproduction.

Natural Vegetation of the United States. The natural vegetation of the United States is broadly divided into forest, grassland and desert shrub. With a map of the United States these divisions were clearly exhibited in a series of colored bromide enlargements on a screen. The suitability of virgin land for various crops is usually indicated by natural vegetation.

Turf. Creeping bent grass for fine turf and cultural method of production and maintenance were illustrated in a panel of colored natural size photographs and photographic enlargements.

Drug Plants and Essential Oils. Cultural tests and field trials with drug plants were illustrated by colored photographic enlargements and supplemented with prepared drug plant material. Volatile and fixed oils such as peppermint, spearmint, wormseed and other oils were shown accompanied by dried plant material from which these oils were extracted. A series of colored photographic enlargements and instructive data on the labels enhanced the value of this exhibit.

Bureau of Public Roads

The exhibit of the Bureau of Public Roads (Plate 191) consisted of a relief map of the United States, 38 by 26 feet, and six booths. On the map were shown the routes of the Federal-aid highway system designated by the State highway departments and approved by the

Secretary of Agriculture in accordance with the Federal Highway Act of 1921, and around three sides of it were paintings representing the historical development of roads in this country during the 150-year period from 1776 to 1926. Other aspects of the highways and their development were presented in three booths entitled respectively The New Freedom of Transportation, Highways from Savagery to Civilization, and Taxation Without Representation. Some of the activities of the Division of Agricultural Engineering of the Bureau were shown by three booths bearing the titles Farm Power Increases Production, Farm Efficiency Improved by Engineering, and Farm Water Control by Engineering.

Federal-aid Highway Map. Upon the relief map were shown in solid red lines the Federal-aid highway system and in dashed red lines the Federal forest highway system.

When standing before the center of the map and looking from the left to the right at the pictorial panels, one saw the high lights of road development during the past century and a half. In 1776 the roads were rough and travel wearying when Thomas Jefferson journeyed from his home in Monticello to Philadelphia to sign the Declaration of Independence. Later, 1794, the Lancaster Pike, the first American macadam road extended from Philadelphia to Lancaster. Its smooth and ample surface thronged with coaches, gigs, and conestogas. As early as 1806, the Cumberland Pike, the first national road, united East and West and served to harmonize and strengthen, if not indeed to save the Union.

In 1904 the horseless carriage was ushered in as a new means of transportation. This carriage was the forerunner of the motor car of today—the cause of modern roads. With the passage of the Federal-aid Road Act in 1916 the National Government again manifested its interest in highway improvement. The increasing range of travel by motor vehicle necessitated continuity of road improvement, unbroken by State lines and resulted in the passage by Congress of the Federal Highway Act of 1921. The designated system was shown upon the relief map. All Federal appropriations for road construction are expended in conjunction with at least equal amounts of State funds on this limited system of main interstate roads.

"The New Freedom of Transportation" showed that Americans may now go and come as they will without restriction through lack of facilities for highway transportation. In 1776 the Liberty Bell proclaimed the freedom of the American people from tyranny. In 1926 the horn of the automobile on improved roads sounds the new freedom of transportation.

"Taxation Without Representation" was the cry which prompted the Boston Tea Party and precipitated the Revolution. Another tax which Americans have rebelled against is that gathered annually by unimproved mud roads which in the United States as a whole reaches a staggering total. "We pay for improved roads whether we have them or not, and we pay less if we have them than if we have not," was the idea expressed by the booth. Excessive gasoline consumption and wear and tear on bad roads exceeds the cost of building good roads.

"Highways from Savagery to Civilization" portrayed the part played by the roads in the building of the nation. It shows the development of transportation facilities from the Indian travois, through the prairie schooner, to the modern motor truck.

"Farm Power Increases Production," illustrated how farm income increases proportionately with the amount of power used. The abolition of manual labor and the adoption of farm machinery has increased the production of one man almost four times in the last 150 years.

In 1776 hand methods were used in agriculture. Labor saving devices in the form of crude machinery began to find favor from 1831 to 1875. In 1926 modern machinery of the highest type is increasing the amount and decreasing the cost of production for the American farmer.

"Farm Water Control by Engineering" illustrated some outstanding facts with regard to the service of the engineer in making water work for the farmer and his wife and provide the house with the modern conveniences of the city dwelling.

Agricultural engineering brings water to the land. "Crops won't grow in dust and sand; there must be water on the land," says the caption on one of the panels.

Drainage is likewise necessary to reclaim farm land. An acre drained is an acre gained. Labor and money are expended annually on thousands of acres which yield no crops owing to lack of drainage. Drowned plants produce no fruit.

"Farm Efficiency Improved by Engineering" was an exhibit which showed how rural engineering increases production and profits and saves time and labor. It utilizes machines as ancient as the pulley and as modern as the airplane to do the farmer's work better, quicker, and cheaper.

Bureau of Soils

The exhibits of the Bureau of Soils illustrated the work of three of its principal activities—Soil Survey Division, the Soil Physics Division and the Fertilizer Resources Division.

The work of the Soil Survey Division has to do with the mapping of agricultural soils in the United States and in this connection a care-

PLATE 192.—Exhibit of natural soil of Norfolk Fine Sandy Loam of the Georgian soil family, and Cecil Sandy Loam of the Carolinian soil family with mechanical, color, and chemical profile charts.

fully worked out scheme of soil classification is necessary. The exhibit of this Division illustrated the broader classification of the main soil groups. The basis of the classification was the individuality of the soil itself as exemplified in the characteristics of color, texture, structure, and chemical composition.

Sixteen samples (Plate 192) of actual virgin soils were so collected in wooden boxes in the field that none of the original natural soil structure was disturbed. The soil boxes were four by eight inches in cross section and five feet long, and the soil samples were taken from the surface of the ground to the full depth of five feet, or below what is usually termed the subsoil. One eight-inch face of the soil column was exposed to view, protected by glass, through which the characteristics of color, structure and something of the texture was seen. The color graduations of the soil were also illustrated by an accompanying soil color chart painted in oil colors. The chemical composition and the mechanical texture of the individual soil were shown in full length charts one foot wide and five feet long exhibited alongside the actual sample. Distinctive colors indicated for the various depths or horizons proportional amounts or percentages of the different textural grades, as sand, silt, clay, in the mechanical analysis chart, and the amounts of silica, iron and alumina, alkaline earths, and alkalis, in the chemical analysis chart. Each soil sample and its accompanying color, mechanical and chemical charts formed one of the sixteen units of the soil exhibit, and were grouped together in a frame which rested on the floor and was slightly inclined from the vertical position.

There were descriptions of individual characteristics of the various members of the exhibit—mechanical, chemical and color charts and soil sample—and these together with a general "Information Sheet" provided sufficient information to enable the observer or soil student to obtain an understanding of the general soil classification scheme as well as the relation which the individual unit bore to the soils of the whole exhibit.

Fertilizer. The exhibit of the Fertilizer Division of the Bureau of Soils was designed to show some of the processes for the production of concentrated fertilizers which have been developed in its laboratories, together with present and potential sources of fertilizer materials. The exhibit was closely associated with that of the Fixed Nitrogen Research Laboratory, which concerned itself with the production of nitrates from the air, and also with the exhibit of the Soil Fertility Division of the Bureau of Plant Industry, which showed some of the results obtained by field tests using concentrated fertilizers.

There were three working models which illustrated processes developed in the Bureau for preparing concentrated fertilizers. *One*

showed the electric furnace method for producing phosphoric acid, one of the basic materials for concentrated fertilizers. *Another* model showed how a concentrated fertilizer, ammonium phosphate, may be made by combining phosphoric acid with nitrogen from the air. A *third* model illustrated how another concentrated fertilizer, potassium nitrate, may be made by treating potassium chloride, a common fertilizer material, with fixed nitrogen gases.

Potash. The possibility of developing a potash industry in this country was illustrated by bottled potash products and by-products from American sources. These included Searles Lake, California brine, Pacific coast kelp, New Jersey greensand, potash from distillery waste and from cement dust, a waste product in the manufacture of Portland cement. The United States has ample sources to make it independent of foreign potash. The exhibit showed how potash as a by-product or as one of several products can be produced economically in this country.

An automatic balopticon presented colored lantern slides of the sources and methods of production of a number of fertilizer materials, designed to give an idea of how fertilizers are made.

There was a display of samples of ordinary fertilizer materials and mixtures together with samples of some of the new concentrated fertilizers. The physical condition of these concentrated materials is superior to most of the materials now in common use. With these new materials it is possible to prepare fertilizer mixtures which have a concentration of nearly five times that of the present average mixed fertilizer. The fertilizer freight bill of the United States now amounts to $20,000,000 annually so it is evident that any considerable increase in the concentration of fertilizers will bring about important savings in this item alone, to say nothing of the savings in the cost of bagging, handling, hauling and distribution in the field.

"Farm Erosion and Restoration." A booth with mechanically dissolved screen pictures represented the destructive effects of soil erosion and how they may be remedied. One picture was a winter scene of an abandoned farm with the hillside and valley soil badly washed and gullied by destructive erosion. When this picture disappeared there was shown a summer scene of the same farm several years later. A dam had been placed across the large eroded channel in the valley; the small hillside gullies had been filled and the field had been terraced. The reclaimed farm appeared in sharp contrast with its previous eroded condition.

Extension Service

The Extension Service exhibit consisted of a feature entitled "The American Farmer—A Partner with Government in National Progress," a booth entitled "Agricultural Instruction—A Service for Teachers," and motion pictures shown daily in the Government Auditorium. The Extension Service is the organization of the Department that comes most intimately into contact with the farm. Largely through it the results of the investigations of the Department of Agriculture and the State agricultural colleges are carried direct to the farmer and his family by the County Agents and County Home Demonstrators; through teachers in the public schools; by means of exhibits at fairs, and motion pictures in theaters, schools, clubs, conventions and other occasions. The Office of Exhibits of the Extension Service was in charge of the Department's entire display at the Sesquicentennial Exposition and maintained, in cooperation with the Department, radio, press and publication services and an *information booth* at which were available Department publications and general information on agricultural subjects and the Department's work.

"The American Farmer" was a booth consisting of a large central illuminated painting and side panels. It represented a young agriculturist awakened to his opportunities and responsibilities a personality of power and intelligence contrasted with the struggling toiler of an earlier day who with his crude implements and primitive methods strove to wrest sustenance from reluctant soil. The painting showed the awakened farmer seated on a modern tractor plowing a fertile field. A tractor, drawing a multiple plow, suggested the great advance in agricultural efficiency that has come through modern inventiveness. In the background was an attractive farm home, well kept in a setting beautified with trees and shrubbery. It was suggestive of a high standard of rural living. Back of the house was a modern barn and silo indicative of prosperity through knowledge of the best agricultural practices.

To the right of the central scene a small painting portrayed a pioneer farmer mowing his wheat with a cradle and to the left a similar painting in which the pioneer harrowed his field with a home-made drag drawn by oxen.

Cooperative Extension. By means of an automatic lantern slide projector, the story of cooperative extension work was briefly told. This story began with a narration of the coming of the boll weevil to the cotton States and showed the demonstrations of better agricultural practices by the farmers. It told about early growth of extension teaching; correlation of extension work after the passage of the Smith-Lever Act; ways in which cooperative extension work has entered into

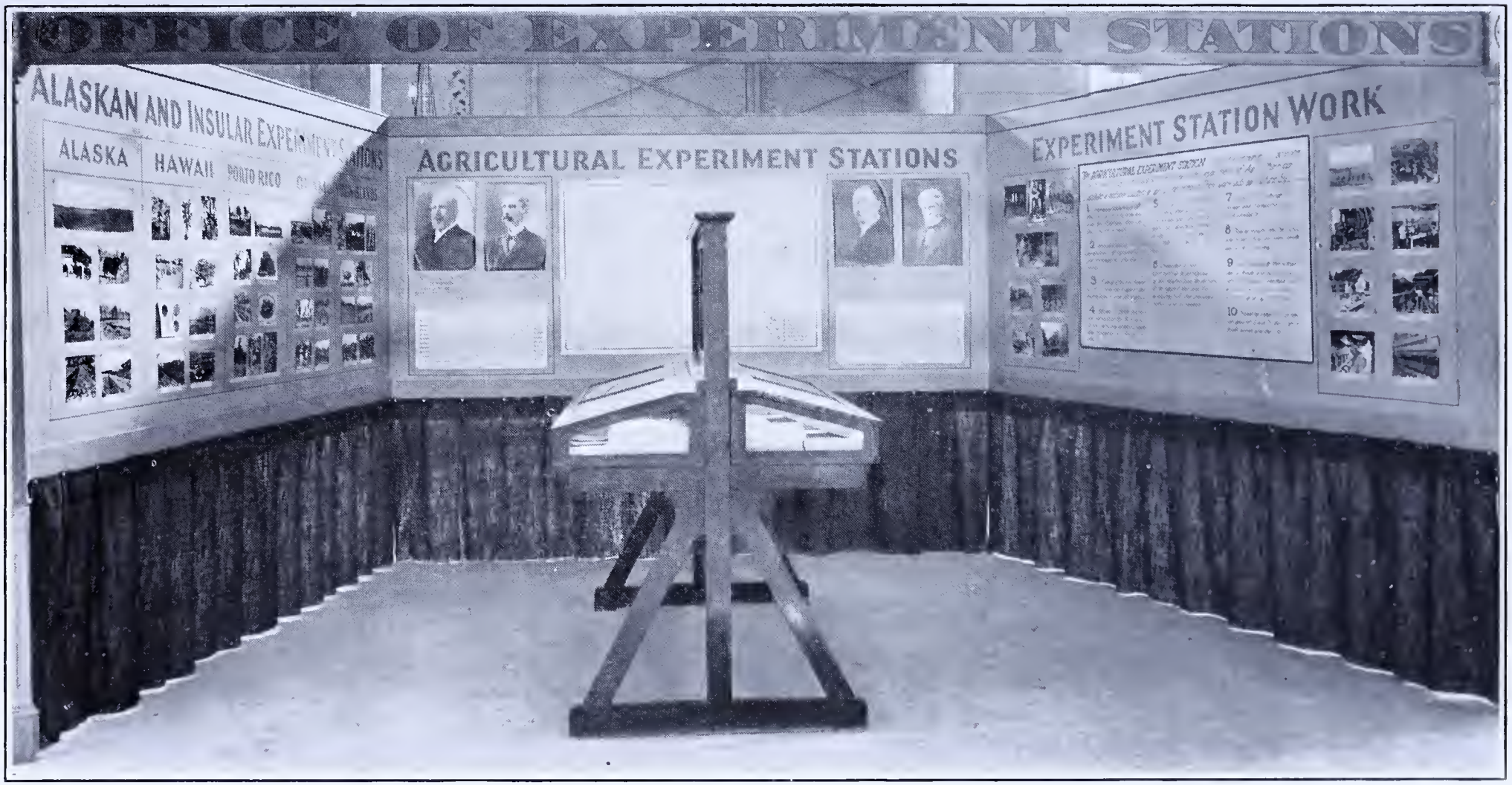

PLATE 193.—Charts, maps, photographs and other descriptive material of the Office of Experiment Stations.

the economical practice of the farmer in growing various crops and livestock; the use of improved equipment; standardization of produce; improved methods of marketing; and the development of farm organization. The influence of extension work on the farm home and on household practices in relation to food, clothing, equipment and surroundings were likewise portrayed as was also extension work among farm boys and girls showing their club activities in the practice of better methods of agriculture and homemaking.

Agricultural Instruction. This exhibit representing a classroom with blackboard surrounding the walls and children looking at a picture projected on a screen illustrated to some extent the work the Office of Agricultural Instruction is doing in extending the services of the U. S. Department of Agriculture to teachers and rural workers throughout the United States. The exhibit consisted of descriptive legends and samples of material available to teachers and means of helping teachers with subject matter problems. At each corner of the booth were tables bearing sample displays of material suggestive of what teachers may assemble or make for their own use.

Motion Pictures. Twenty-one motion picture films from the collection of the Department of Agriculture were shown in the government auditorium.

Office of Experiment Stations

In a three-panel booth (Plate 193) were charts, maps, photographs and other forms of descriptive material. The exhibit pointed out the history of the Office of Experiment Stations, its function in the United States Department of Agriculture and its relation to the agricultural experiment stations in the States and in Alaska and the insular possessions.

A section of the exhibit devoted to the experiment stations in Alaska, Hawaii, Porto Rico, Guam and the Virgin Islands, which are maintained by the United States Department of Agriculture and supervised by the Office of Experiment Stations, illustrated the development, work and equipment of these institutions and their influence in advancing the agriculture of their respective territories. In a similar manner there was indicated the history and growth of the agricultural experiment stations throughout the United States, the legislation assuring their establishment and maintenance, the location and distribution of the main stations, the branch or substations, and other experimental activities, and the lines and methods of work and different forms of equipment, such as buildings, scientific apparatus and special installations. In addition statistics were presented relating to the financial

PLATE 194.—General view of the Department of Agriculture exhibit looking west. Bureau of Plant Industry on left, Office of Information, Weather Bureau and Bureau of Soils on right.

support of the State experiment stations, the number of persons employed, and, in general, to the scope of experiment station activities.

Office of Information

The exhibit of the Office of Information, a booth with glass topped counters, panelled walls and office furniture, was designed to call attention to the methods by which results of the department's scientific and research work are made available to the public. This was done by means of printed publications and periodicals, by releases issued to various newspapers and magazines, and by programs prepared for radio broadcasting stations all over the United States. (Plate 194).

Each of these three general methods of releasing information was illustrated by a graphic exhibit. An attendant was present to assist inquirers and to receive requests for information.

The Information Booth served also as the business headquarters for the entire Department exhibit which was under the direct supervision of the Department's Office of Exhibits.

Federal Horticultural Board

The exhibit of the Federal Horticultural Board consisted principally of a photographic portrayal of the important phases of the Board's work. The display was placed in a booth so constructed as to give wall space and the proper lighting effects. Some two hundred enlarged photographs were on display panels grouped according to subject matter.

The photographs supplemented by lantern slides and special mounts showed:

Some of the highly injurious foreign insects and plant diseases not yet introduced into or not widely distributed in the United States, and the injury to plants, fruits and vegetables which they cause.

The necessity for restricting the entry of certain plants, fruits, and vegetables which carry or are infested with certain of these foreign pests.

The extent of the organization of the Plant Quarantine Inspection Service of the Federal Horticultural Board and its various activities in enforcing the quarantines and restrictive orders promulgated by the Secretary of Agriculture.

The Federal Plant Quarantine Act of August 20, 1912, empowered the Secretary of Agriculture to prohibit or regulate the entry of foreign plants and plant products to prevent the entry into this country with such products of new and dangerous plant pests, either insect enemies or plant diseases.

Under this Act some twenty-two quarantines and restrictive orders prohibiting or regulating the entry of foreign plants and plant

PLATE 195.—Fixed Nitrogen Research Laboratory exhibit.

products are now being enforced. There are some seventeen domestic quarantines controlling the interstate movement of plants and plant products.

Fixed Nitrogen Research Laboratory

The display, which the Fixed Nitrogen Research Laboratory produced at the Sesquicentennial Exposition, showed some of the technical and scientific features of the industry as at present constituted. (Plate 195). The synthesis of ammonia which is at the basis of the present industry in this country, was illustrated by a demonstration in which ammonia was produced by the combination of nitrogen and hydrogen by means of a chemical agent known as a catalyst. This experiment a few years ago was considered to be one of the most difficult chemical reactions known, and was usually carried out by the chemist only in the highly technical environment of the laboratory.

The technical complexity of the synthetic ammonia process was shown by a model of a direct synthetic ammonia plant, which contained all the equipment and apparatus necessary to make ammonia, using the nitrogen of the air and hydrogen obtained from water. This model was the first view which the general public has ever had of a modern synthesis plant.

The production of nitric acid from ammonia, which is the product of principal interest from the standpoint of military requirements, was illustrated by a demonstration in which the oxidation of ammonia was conducted in an apparatus made entirely of glass.

Among the most noteworthy developments in the field of nitrogen fixation since the establishment of the laboratory, and in which this organization has taken a leading part, is the development of the industry from nothing in 1919 to a production of over 30,000 tons per annum in 1926.

While fixed nitrogen is only one of the constituents of plant food in agricultural fertilizers, it is probably the most elusive one of the three plant foods commonly recognized to be of general importance. Phosphorus and potash are also of great importance to agriculture, consequently it was thought desirable to show the relationship between compounds of nitrogen and these other plant foods. The compound of nitrogen and phosphorus which will in the future undoubtedly be of great importance in fertilizer production, and which has already found a considerable use in Europe, is ammonium phosphate. The exhibit included a model of an ammonium phosphate plant, constructed by the laboratories of the Bureau of Soils investigating fertilizer resources. It illustrated the manner in which ammonium phosphate is produced from phosphoric acid and ammonia. The Bureau of Soils Laboratory

PLATE 196. Scenic settings told the story of American forests from the virgin stands that the colonists found through the periods of wasteful lumbering, and the aftermath of fire to the forest that by proper management perpetually renews itself, thereby making timber supply keep pace with demand.

PLATE 197.—A forest of white pine such as the white men found when they first came to America.

PLATE 198.—Deserted cabins and a dilapidated mill told silently the tale of an industry that had passed and of people that had drifted.

also constructed an all-glass apparatus in which potassium nitrate, a fertilizer constituent, was produced.

The exhibit contained also a scientific curiosity which attracted considerable public interest. It was the spectacular glow produced by high tension electrical discharge in nitrogen. This glow is a manifestation of what is known to scientists as "active nitrogen," which is at present occupying the attention of those chemists and physicists interested in the nature of the atom.

During the course of the entire exposition, a competent representative of the Laboratory was present to demonstrate the various experiments and explain their connection with the general problem of nitrogen fixation.

Forest Service

The exhibit of the Forest Service consisted of four sections (Plate 196) each representing a period in the history of American forests. They were composed of scenic backdrops with foregrounds of actual forest materials blending into them. Each had its appropriate legend suspended from tree branches telling the stories of virgin forests, destructive lumbering, the ravages of forest fires and the forest as they should be handled.

The Forest Primeval was a portrayal of a forest of white pine such as the white men found when they first came to America (Plate 197). The words of the legend quoted from President Coolidge described the situation that concerns every American citizen:

> "The era of free, wild timber is reaching its end, as the era of free, wild food ended so long ago. We can no longer depend on moving from one primeval forest to another for already the sound of the axe has penetrated the last of them."

Careless Lumbering. The second section pictured savage desolation (Plate 198). It was typical, however, of vast areas that have been stripped of their timber and then abandoned. Deserted cabins and a dilapidated mill told silently the tale of an industry that had passed. Aside from necessary clearing for farm land, careless lumbering and fire have been the chief agencies in the destruction or deterioration of the forests. Although considerable progress has been made in forest fire control and although here and there steps have been taken to lessen the destruction caused by careless lumbering, the job is only started. The words of the legend of this scene were also quoted from President Coolidge:

> "Much of our cut-over land, lying idle or half productive, is now an immeasurable loss. Idle forest land has scrapped schools,

PLATE 199.—Forest fires, 75,000 of them each year, eat into the vitals of America's forests.

PLATE 200.—Timber cropping, the orderly and satisfying result of so managing the forest that it can perpetually renew itself.

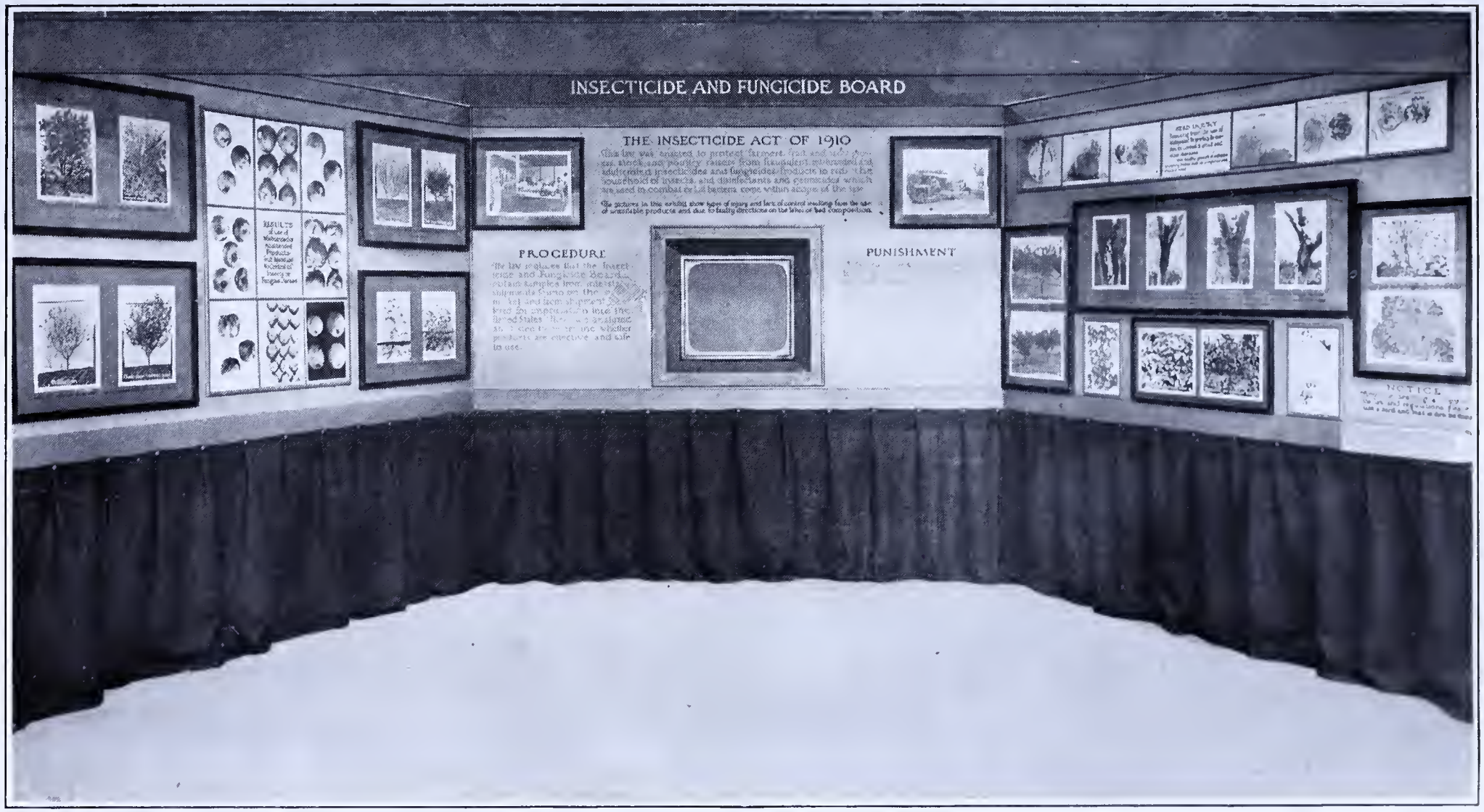

PLATE 201.—The Insecticide and Fungicide Board exhibit.

factories, railroads, and towns; it has dotted the land with abandoned farms; it has created a migratory population."

Fire. The third scene showed the devastating effects of fires, of which 75,000 each year eat into the vitals of America's forests (Plate 199). The eloquent words of the Prophet Joel are appropriate here:

"A fire hath devoured the pastures of the wilderness, and a flame hath burned all the trees of the field."

Forest Culture. In the final section was portrayed the orderly and satisfying result of so treating the forest that it can perpetually renew itself (Plate 200). From this scene it was obvious that we can use the forests and have them too, and that in preserving some of the beauties of the primeval forests we also preserve their vital energies and make possible the continuance of the human communities depending upon them. Again the words of President Coolidge are most appropriate:

"Strange as it may seem the American people, bred for many generations to forest life, have not yet acquired the sense of timber as a crop. Handled by the best timber cropping methods, our present forest land could be made to grow even more timber each year than we now use."

Insecticide and Fungicide Board

A booth with center and side panels upon which was presented the exhibit of the Insecticide and Fungicide Board (Plate 201). Photographic enlargements, text and lantern slides conveyed information regarding the purpose of the Insecticide Act of 1910 and the function of the Board. The exhibit showed that the purpose of the Act is to protect users of insecticides and fungicides (including disinfectants) by requiring manufacturers to market correctly and truthfully labeled products which are of proper quality and strength. The law extends protection particularly to farmers, fruit and truck growers, stock and poultry raisers, and others who use insecticides, disinfectants and germicides.

The exhibit taught that extreme care should be exercised in the selection and application of insecticides and fungicides if it is expected to control the pests infesting crops, animals and homes. To this end some of the pictures showed fruit trees, fruits of various kinds, grape vines, seed grain, etc. Types of injury and lack of control resulting from the use of usuitable products or faulty directions on the label or bad composition or materials were portrayed, as were also properly treated companion trees, fruits and grains. Users of insecticides and fungicides were urged to read with care the labels appearing on products, and their attention was called to the fact that claims in news-

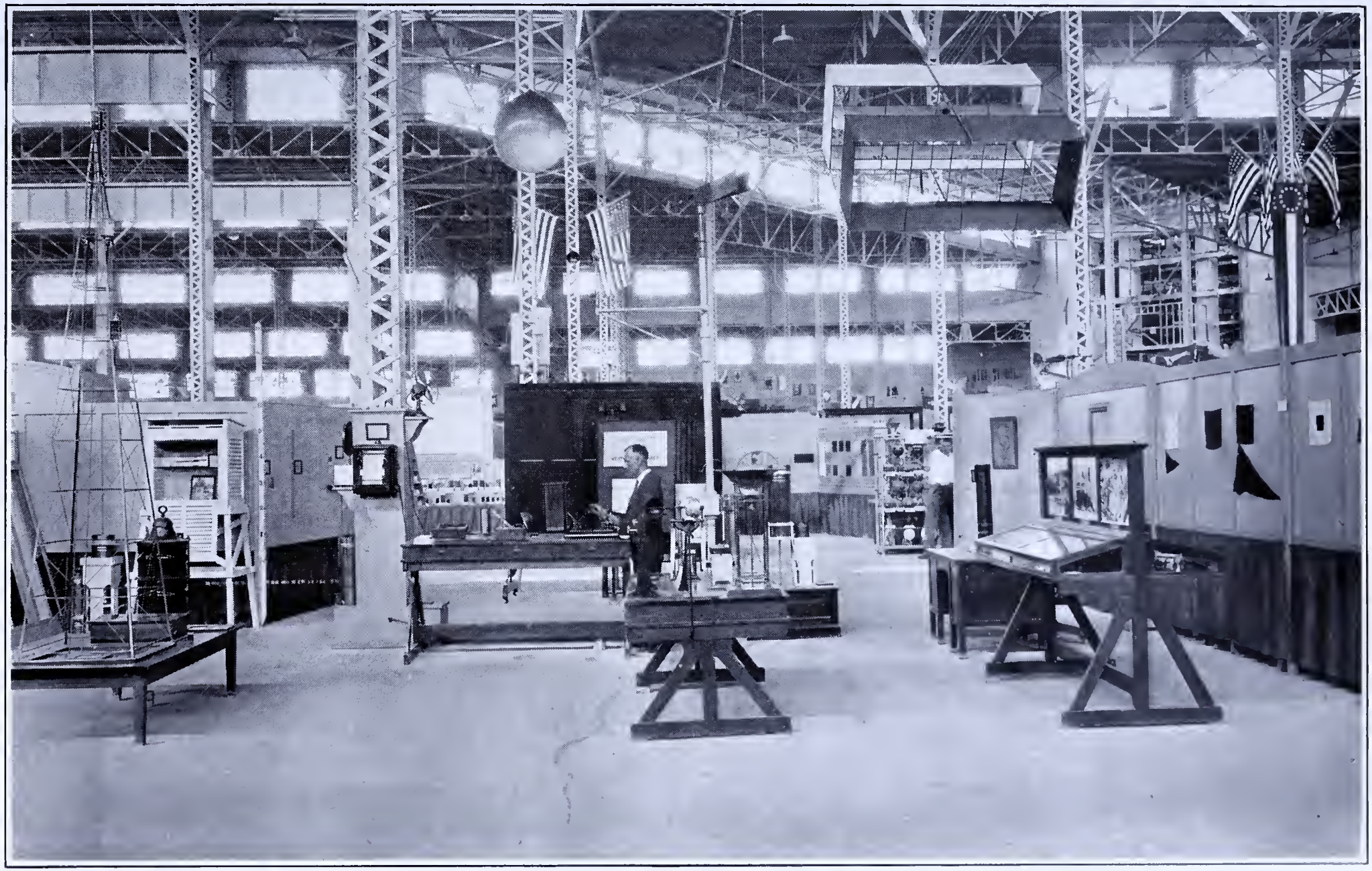

PLATE 202.—The Weather Bureau exhibit was in the form of a first class weather station.

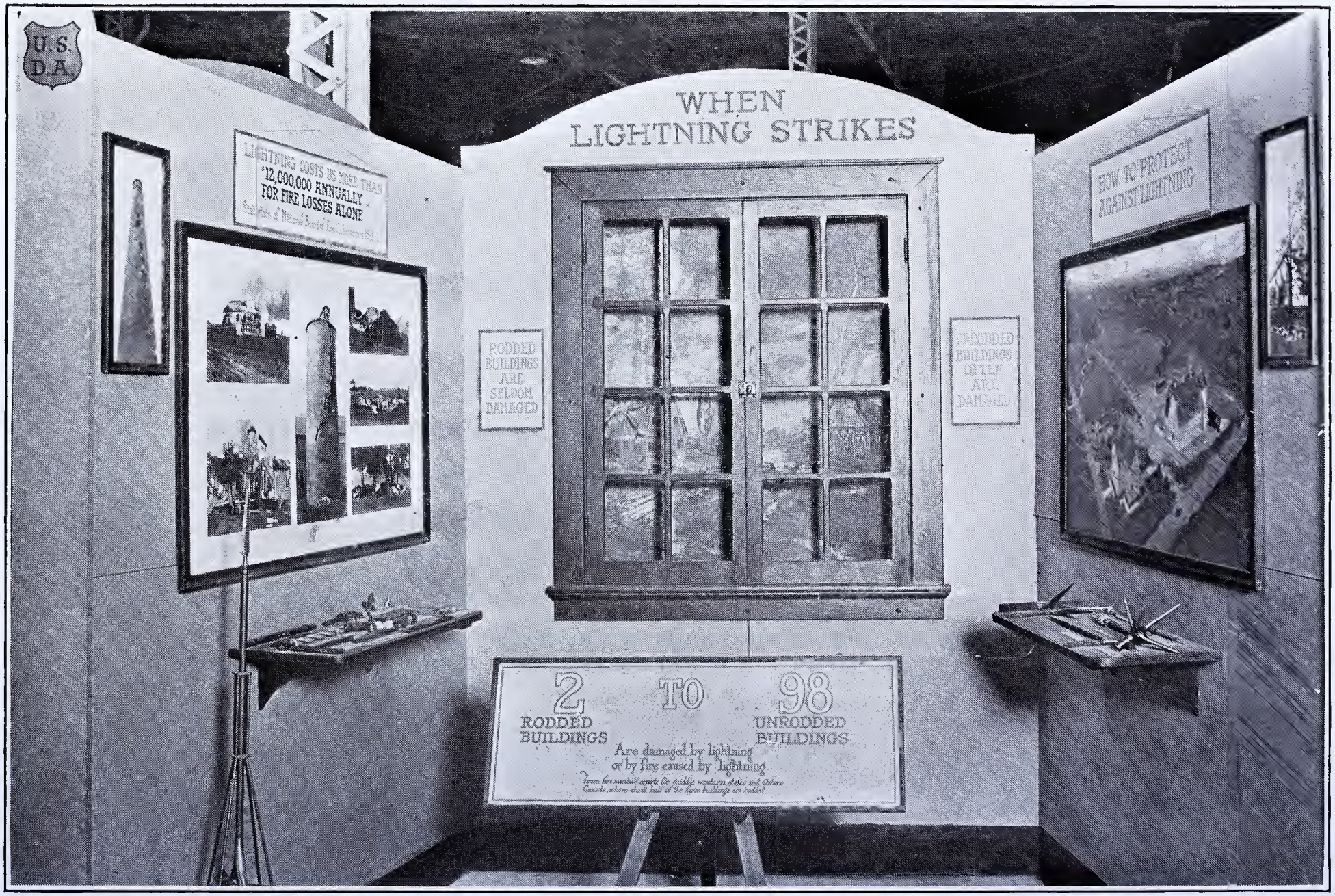

PLATE 203.—Mechanical apparatus produced a lightning flash, a crash of thunder and the glare of a burning building on the one hand while with a change of scene there was presented the same natural phenomena with a building that did not burn because it was properly rodded.

paper and circular advertisements which are not covered by the law may be entirely different from the efficacy claims on labels.

Weather Bureau

The Weather Bureau exhibit resembled in a general way a Weather Station of the first order. Its principal feature was the collection of standard instruments such as are in daily use in securing data for weather forecasts. (Plate 202).

First in importance among these instruments were those deemed essential to all the principal observing stations. Among these were the quadruple register, wind vane anemometer, rain and snow gages, sunshine recorder, maximum, minimum and wet and dry thermometers, barometers, barographs, and thermographs. Other items in the exhibit, including cooperative observers' equipment were instruments for explorations of the upper atmosphere—instruments for the study of frost conditions and for the prevention of frost damage to crops, instruments for stream stage measurements.

Storm-warning towers, flags and lanterns. About 400 storm-warning stations displaying flags by day and lanterns by night, for the benefit of navigation, are in operation on the Great Lakes and the Atlantic, Gulf and Pacific coasts. All stations hoist flags in advance of approaching winds dangerous to shipping, and for night displays most of them are provided with lanterns installed on steel towers, a model of which was shown. Explanation of the warnings were on cards nearby. A full-sized electric lantern was also on exhibit.

Automatic Projector. Pictures and pointed statements in connection with concrete activities and equipments illustrated special items and the uses to which certain mechanisms are put. Seventy-two slides were shown upon a screen, by an automatic projector and gave a comprehensive idea of the many and varied duties performed by the bureau.

Multiplex frames. Additional pictorial information, and a valuable series of weather charts, were displayed on multiplex frames. Among these were some which showed certain average conditions of weather over the world, though most of them showed average and special conditions for the United States only. Precipitation, temperature, frost, humidity, sunshine, cloudiness, and daily weather, were featured.

Attention was especially paid through the pictures to the various phenomena of weather. There were views of cloudland; of storms and their effects, as related to floods, hurricanes, tornadoes, hail, snow, and sleet; besides other scenes of interest which were disclosed in this chart and picture collection.

Lightning Booth. The lightning booth, entitled "When Lightning Strikes" (Plate 203), presented an object lesson showing a result of pro-

PLATE 204.—The Daily Weather Map.—From it the exposition visitor could gain at a glance a good idea of what the weather was "back home."

tection and non-protection. Mechanical apparatus produced a lightning flash, a crash of thunder, and the glare of a burning building on the one hand while with a change of scene there was presented the same natural phenomena with a building that did not burn because it was properly rodded. Appropriate text discussed the protection of buildings from lightning through proper rodding.

The Daily Weather Map (Plate 204) was a visible picture of simultaneous weather conditions over the entire United States. Upon receipt of the telegraphic messages conveying the results of the morning weather observations from all parts of the country, the data were assembled upon the map, which was of glass, so that, at its completion, the areas of fair or stormy, cool or warm weather, over the United States were well outlined. The visitor from any portion of the country could gain at a glance a good idea of what the weather was "back home." This map with its daily forecasts rounded out the general exhibit.

An attendant from the Weather Bureau in Washington was in charge of the exhibits, and demonstrated their use to visitors.

Aside from the observations made by its major stations, the Weather Bureau collects temperature, precipitation, and weather data from about 4,500 cooperative stations in the United States, the West Indies, and Alaska.

THE DEPARTMENT OF COMMERCE

THE DEPARTMENT OF COMMERCE

Foreword

This great department made an exceedingly interesting and exhaustive presentation of its manifold activities in the fields of industry and commerce, and in those lines designed for the protection of human life and conservation of property. Its vast number of exhibits, all neatly and uniformly labeled and classified, nearly every object illustrating a different project, created in the minds of visitors not only a deep impression of the extent and value of the work demonstrated but also wonderful visions of possible future developments.

So ample was the material in some of the bureaus that there was an overcrowding here and there but this was largely overcome through careful installation. The great amount of care and labor necessary in successfully assembling and installing such a varied and extensive collection within the very limited period allowed for the work, was clearly evident.

The cost involved in an undertaking of this character where the exhibits are so classified and arranged as to clearly bring out the stories they are designed to tell, giving instruction and enjoyment to all who see them, is insignificant when we consider the lasting benefits derived from their educational force, and their power in stimulating and directing progress in the years to come.

Exhibits of the Department of Commerce at the Sesquicentennial Exposition 1926

Introduction

The exhibits occupied a north-central floor space, rectangular in shape, 218 feet long, 118 feet wide, the long dimension running east and west (Plate 205). This rectangle was quartered by two 14-foot aisles bisecting the space at right angles. At the intersection of the aisles a 40-foot circle was devoted to an ornamental structure, in the form of a circular gallery for eight mural paintings showing artistic conceptions of future developments in the field of commerce.

The four smaller rectangles formed by the aisles were each divided by a partition and the resultant spaces were assigned to the bureaus of the Department. In the southwestern corner a further subdivision was affected by means of a wooden balustrade and three bureaus were grouped in this space.

A uniform color scheme of gray on balustrade, partitions, gallery and other structures individualized the Department of Commerce exhibit. A double coating of gray water-resisting concrete paint was applied to the rough floor and gave excellent service in allaying the dust and improving the appearance of the area.

Central Gallery.—The open-top circular gallery, 13 feet high was finished in sanded gray and striped at the four doorways with blue and gold. The hardwood floor in contrasting colors was given a bright natural finish. Surrounding the steel column in the center was an octagonal bench for visitors and an artificial tree concealed the column itself.

The eight paintings set into the interior wall and protected by brass stanchions and blue cord, bore the following titles:

Electrification	Inland Waterways
Railway Transportation	Automotive Transportation
Air Commerce	Simplified Practice
Foreign Trade	Aerial Navigation

Decorations.—The corners and main entrances to the area were marked by slender, fluted columns, each surmounted by an eagle and bearing a banneret in the national colors, showing the word "Commerce" in the blue field. The numerous steel columns supporting the roof were decorated with four American flags set in at the usual dis-

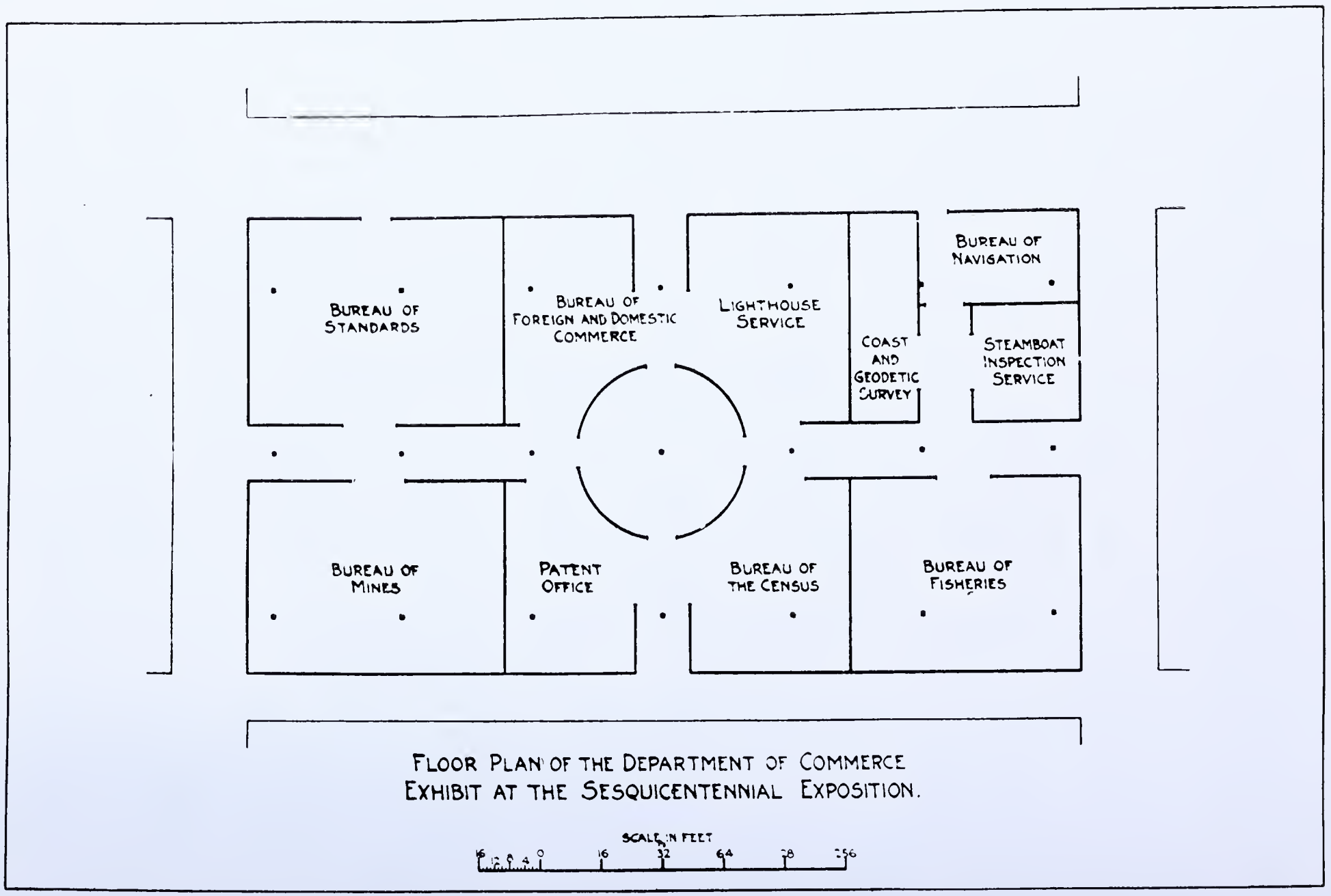

PLATE 205.—Floor plan—Department of Commerce exhibit.

play angle at a height of 25 feet, and below them fell long pennants of the conventional red, white and blue.

Signs.—Over the center of the Commerce group and facing the main entrance of the building, an appropriate sign in black and gold identified the departmental exhibit. Smaller signs of similar design and finish, placed on the partitions or suspended on chains identified the bureau exhibits while narrow signs affixed to the balustrade served the same purpose.

Character of the Exhibits.—While the paintings in the central gallery gave hints of the Department's conceptions of future developments (some already well under way), the Bureau exhibits were devoted to showing the most modern and practical of their present equipment, methods and services. Emphasis on development was obtained by contrast with ancient pieces in many cases, in others by replicas, or by photographs, graphic charts, and statistics. More attention was given, however, to presenting as fully as possible to the public the present-day operations, functions and typical services of each of the ten bureaus of the Department. The exhibit groups were:

The Bureau of the Census
The Coast and Geodetic Survey
The Bureau of Fisheries
The Bureau of Foreign and Domestic Commerce
The Bureau of Lighthouses
The Bureau of Mines
The Bureau of Navigation
The Patent Office
The Bureau of Standards
The Steamboat-Inspection Service

Grouped with the Bureau of Standards, was the exhibit of The National Committee on Wood Utilization.

The size of the space assigned each bureau was governed by the bulk of the materials each had to exhibit and not by the size of the service. Two bureaus had railway cars present on tracks within the building as supplements to their regular floor exhibits—the Mines Instruction and Rescue Car, and the Railway Track-scale Test Car of the Bureau of Standards.

The Steamboat-Inspection Service had two full size and fully equipped lifeboats on view. One of these, the rescuing boat from the U. S. Lines, S. S. "Roosevelt," which went to the succor of the sinking "Antinoe" in mid-Atlantic in January, 1926, was moved to a separate space adjacent to both the Department of Commerce and the U. S. Shipping Board areas. Here a platform and two stairways were constructed to afford all visitors an easy view of the boat and its equipment.

The exhibit items were each labeled by neatly printed, descriptive cards. Details of the exhibits of the various bureaus are given later in this report.

Motion Pictures and Stereopticons.—Several of the bureaus utilized small motion picture machines in their exhibits, notably Foreign and Domestic Commerce, Fisheries, and the Steamboat-Inspection Service, while the Bureau of Mines illustrated "first aid" and "Mine rescues" by automatic lantern-slide projectors.

In the auditorium beneath the tower of the exhibit building films showing activities of the Bureau of Lighthouses and the Bureau of Mines were exhibited regularly.

Publications Distributed.—A pamphlet describing the activities of each bureau of the Department was available for distribution to inquirers. Each bureau also had on hand for judicious distribution a pamphlet descriptive of its activities. These publications were supplemented in the case of the Patent Office, the Census Bureau, and the Bureau of Foreign and Domestic Commerce by copies of regular free-issue information on procedures, statistics, and trade data.

Administration and Personnel.—Normally the exhibits of the Department of Commerce were maintained and demonstrated by a force of 25 persons. In charge was the Assistant Contact Officer for the Department, under whom was a foreman and three laborers for general work, including moving, cleaning, minor repairs, painting, and such tasks. A permanent exhibiting staff had charge of the Bureau of the Census, the Coast and Geodetic Survey, the Bureau of Fisheries, the Bureau of Mines, and the Bureau of Navigation exhibits. Other bureaus, however, notably the Lighthouse Service, the Patent Office, the Bureau of Standards and the Steamboat-Inspection Service manned their exhibits with a changing group, selected in most cases for special merit or ability, each one serving for a limited period only at the Exposition. The hours of duty extended from 9.00 a. m. to 9.00 p. m. each day except Sunday, when the building opened at 10.00 a. m. and closed at 6.00 p. m. Bureaus having more than one person on duty were manned with at least one person seven days a week. Saturdays and Sundays were the heaviest attendance days. Accordingly, Department of Commerce personnel were on duty on those days as well as on such other legal holidays as Independence Day, Columbus Day, Labor Day, and Election Day.

At the outset of operations in Philadelphia, arrangements were made between the Navy Department and the Department of Commerce enabling the latter to use any services or supplies available in the Philadelphia Navy Yard.

The Lighthouse Services in the Third and Fourth Districts, particularly the engineering, constructing and transport branches, were also utilized in many emergencies, during installation, operation, and dismantling periods.

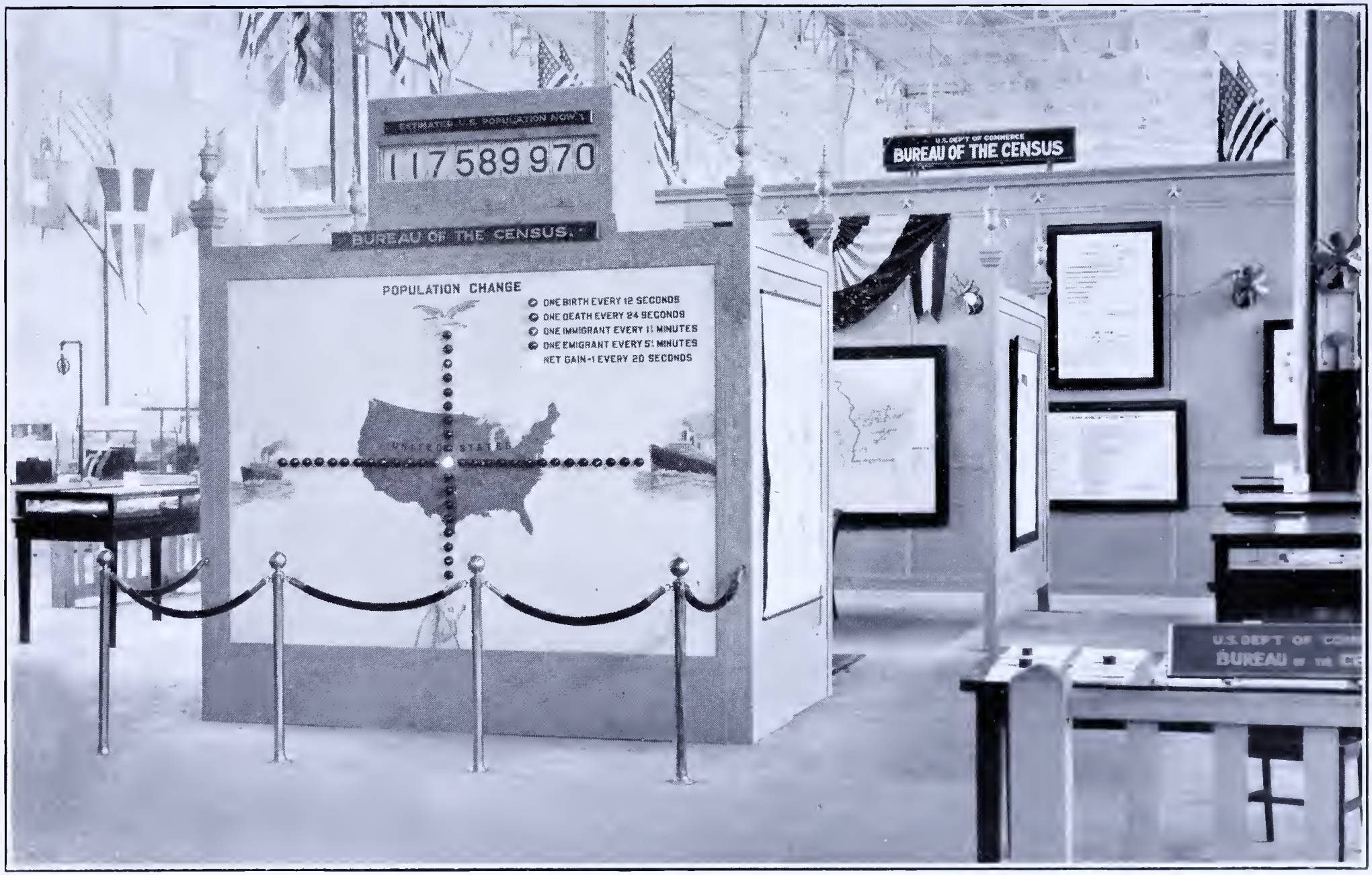

PLATE 206.—Electric Chart—"Changes in Population"

Photographic Record.—A complete photographic record was made of the Department's exhibits. Detailed views were obtained in the Bureau of Mines and the Bureau of Fisheries sections for the purpose of furnishing collaborators with a picture record of their machinery and products in place.

Installation.—The floor space allotted the Department of Commerce was ready for use on June 14, and construction of partitions, booths and balustrade commenced on that date. First carload shipments of exhibits arrived on June 22. Excessive heat and violent rain storms during the entire installation period militated against the best efforts of all workers. Actual operations consumed a period of two months, or until August 15. A force of approximately 100 men was engaged at the height of installation work.

Maintenance.—The total space occupied by the Department of Commerce, including the two railroad cars and the "Roosevelt" lifeboat, was approximately 37,000 square feet. Routine cleaning, repainting, and minor repairs were handled by a labor force of one foreman and three laborers.

Each bureau of the Department was represented by from one to four persons, as the situation required. These representatives demonstrated the exhibits and explained to visitors the various operations of their particular service, furnished them with publications and instituted correspondence to secure further specific information when required.

Description of the Exhibits

Bureau of the Census

The work of the Bureau of the Census touches the life of every individual in this country and its exhibit at the Sesquicentennial Exposition at Philadelphia was designed to acquaint the public with this fact, graphically. Some information is available in that Bureau concerning each life, from birth to death, or from date of immigration. A large electric chart (Plate 206) showed population changes by means of electric flashes. The lights from the center to the stork pictured at the top flashed every 12 seconds to show a birth; those to the outgoing boat flashed ever 5¾ minutes to indicate an emigrant; those to the incoming boat flashed once every 1¾ minutes to indicate the arrival of an immigrant; those from the center to Father Time with his scythe at the bottom of the chart flashed once every 24 seconds to indicate a death; and the center white light flashed once every 20 seconds to indicate the net gain in the population. With every flash of that center light another inhabitant was indicated on the big electric counter at the

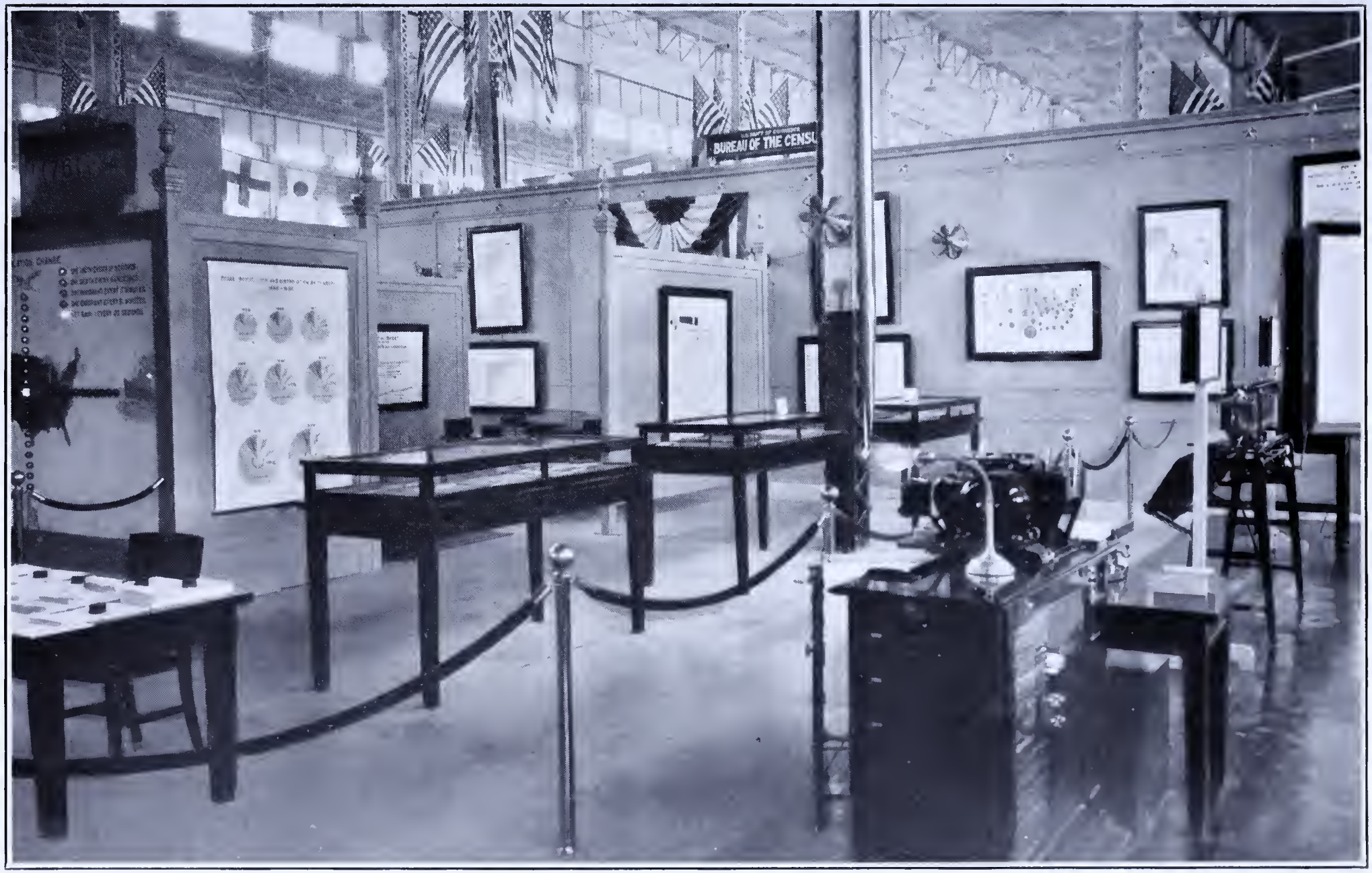

PLATE 207.—Card punching and assorting machines. Bureau of the Census exhibit.

top of the chart which showed that on November 27, 1926, the estimated population of Continental United States was 117,589,970.

The statistical facts presented by this chart like all other census data are compiled by means of the electrical card-handling equipment which was also on exhibit (Plate 207). This was composed of a punch machine, with which an average operator punches 2,000 cards in a 7-hour day to reduce to units the facts collected on census schedules; a sorting machine which is capable of sorting 125,000 of these cards a day, and a tabulating machine which is capable of tabulating 168,000 cards a day. All these machines are designed and built by the staff of the Census Bureau.

Supplementing the large electric chart, there were exhibited a number of smaller maps and graphs which showed the growth of the country in population, agriculture, industry and finance, as indicated below:

Circle Chart—Total U. S. population and its elements: 1850-1920. This chart, consisting of eight circles, one for each census from 1850 to 1920 was designed to show the changes in the proportions of the white and colored classes composing the population of the United States during the past seventy years.

Circle Chart—Males and Females gainfully employed 1920.—This chart, consisting of two circles, one for males and one for females, showed the proportion of each sex engaged in the nine general divisions under which occupations were classified in 1920. These general divisions were as follows: Agriculture, forestry, and animal husbandry; extraction of minerals; manufacturing and mechanical industries; transportation; trade; public service (not elsewhere classified); professional service; domestic and personal service; and clerical occupations.

Line Chart (semi-logarithmic scale)—Population, value of manufactures, and value of all farm products: 1850-1920.—This chart, with the census years from 1850 to 1920 plotted along the base line, represented the increase in the value of manufactures and in the value of farm products in comparison with the increase in the population.

United States Map—Showing number, acreage, and value of farms, distributed by states 1925.—This map had colored circles indicating the relative number, acreage and value of farms in each state as compared with other states.

Series of Agricultural Graphs.—These maps indicated the number of various kinds of live stock on farms, the value of dairy products sold by farmers, and the production of farm crops. Much of the data were shown in comparison with figures for earlier census years.

Bar Chart.—Showing relative importance of industrial groups: 1921 and 1923.

Bar Chart.—Showing relative importance of industries reporting products valued at $1,000,000,000 or more, 1921 and 1923.

United States Map—Wage earners in manufacturing industries, per cent of total population, 1923.—This map showed for each state the proportion expressed by a percentage which the number of wage earners in manufacturing industries in 1923 formed of the total population.

Centers of Population, Agriculture, Manufacture, etc., at Various Censuses.—This map of the United States shows vividly the steady movement Westward in all lines.

Map of Philadelphia and Environs, 1776-1926.—This map shows the expansion of the city over a period of 150 years.

Dot Map.—Showing for 1920, distribution of the population of Pennsylvania.

Map—Showing present extent of the birth and death registration area.—Thirty-four states are now included in the birth registration area and 41 states in the death registration area. Every effort is being made to bring all states into the registration area for births and deaths prior to 1930, the date of the next census of population.

A Line Chart.—Called "Victory and Defeat," showing, in contrast death rates from typhoid fever and automobile accidents for all death registration states in 1900 and for Philadelphia.

"Clearing House of Business Statistics."—Showing in graphic form sources from which current data are collected and methods used for their dissemination. The Survey of Current Business, which is published by the Bureau of the Census monthly, has grown, in a period of 5 years, to contain 1,500 items.

"Danger Signal for Business Man."—This chart shows our combined numbers for production, manufacturers' stocks, and unfilled orders.

Bar Chart.—Showing revenue receipts and governmental-cost payments for 48 states, 1915-24, and per capita net debt at close of year for 48 states, 1915-24.

Chart Showing Revenue Receipts.—Chart showing revenue receipts and governmental-cost payments for cities having 30,000 population or more in 1920, for specified years, 1915-24.

Line Chart.—A line chart showing cotton production, consumption, and spindles for the United States and for the World: 1908 to 1925. During the period covered by this chart, the number of spindles in the cotton growing states increased from 10,464,123 to 17,634,948.

A large number of the reports of the Bureau were also on exhibition. A single volume necessary to contain the entire census report for

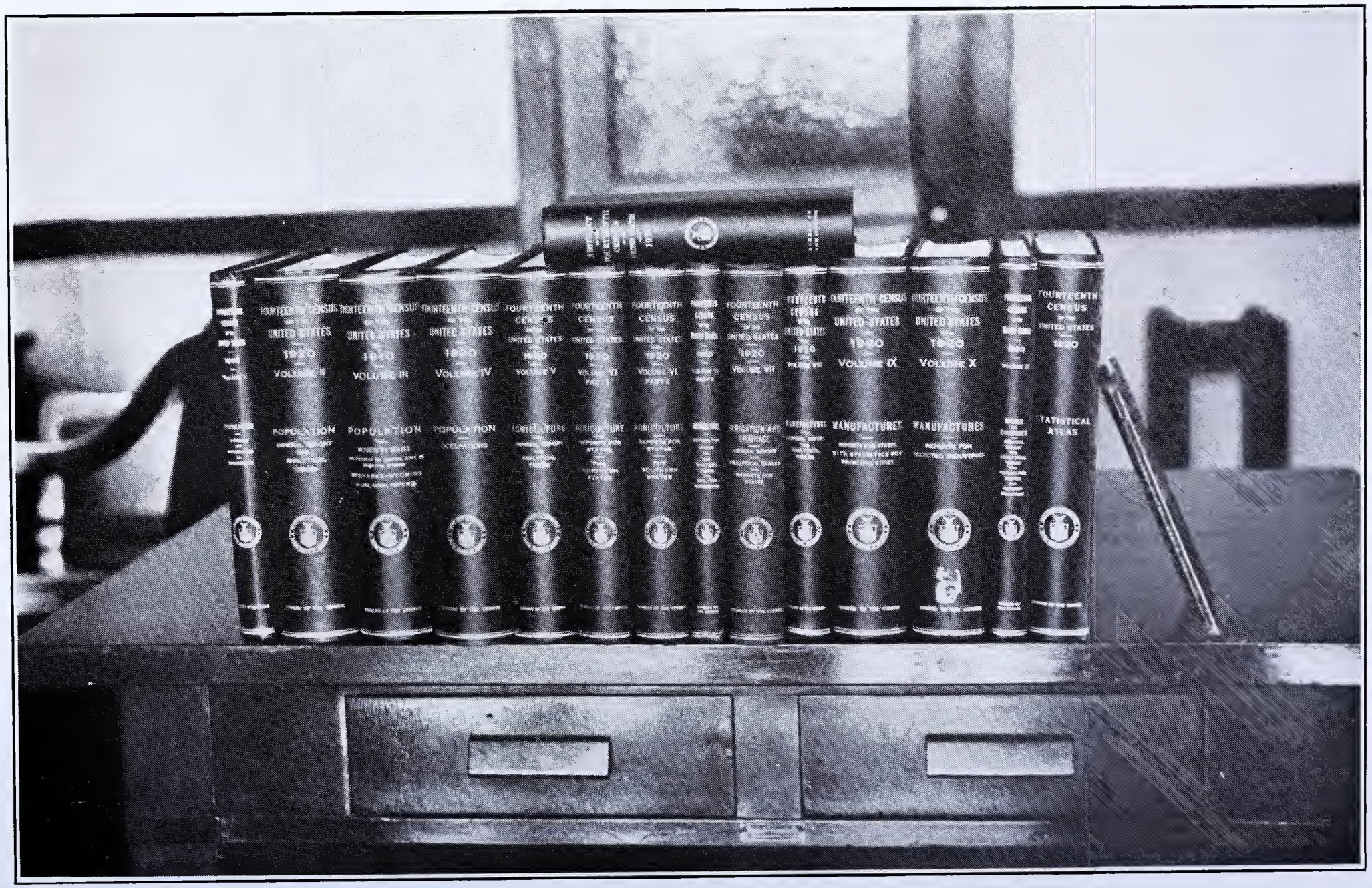

PLATE 208.—Census reports 1790 and 1920.

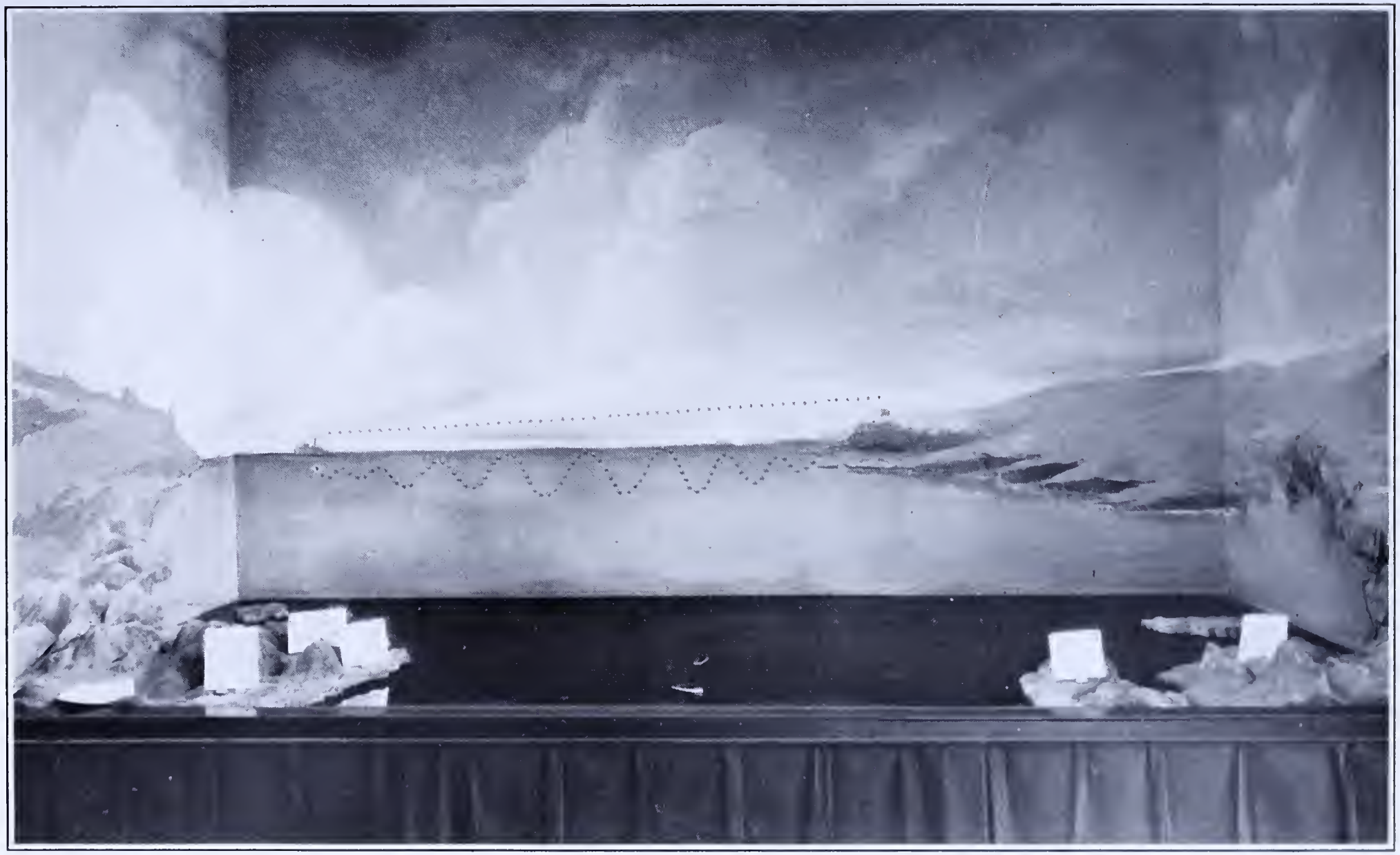

PLATE 209.—Sound-range and wire drag models.

1790 was shown for comparison with the 13 volumes of statistical data constituting the Census Report of 1920. Some of the original schedules for 1790 were also on exhibition as were those for the census of 1920. (Plate 208).

Coast and Geodetic Survey

The Coast and Geodetic Survey was one of the three bureaus grouped in the southwestern corner of the Department's space. It occupied an area 54 feet long by 18 feet wide, separated from the Lighthouse Exhibit by a fixed partition.

The work of the Survey at sea and on land was illustrated by the exhibits of deep-sea sound devices, surveying instruments, and the other highly specialized equipment developed and manufactured by the Survey. Pictures, charts, and publications, furnished the visitor with an idea of the finished work of the Survey.

The most striking feature of the whole exhibit was the presentation of two methods regularly employed by the Survey in its maritime work; one, an operating model of the wire drag at work, the other, an electrically operated illustration of acoustic sound wave ranging. (Plate 209).

The wire drag is a device used to locate pinnacle rocks, glacial builders, coral heads, and other submerged menaces of such limited extent that surveys with the lead line frequently fail to detect them.

Acoustic sound-ranging is a modern method of accurately fixing the surveying vessel's position when out of sight of land. This has been perfected by the Coast and Geodetic Survey recently.

The marine view in the exhibit showed a Coast Survey ship at work some distance from the shore. Perched on a rocky bluff along the beach was a small shack, representing an intended radio station. From the wireless shack to the ship there extended a straight line of small electric bulbs, while from a point immediately below the ship there stretched a wavy string of bulbs back to the beach below the wireless station. By means of a flasher mechanism at the back of the painting a light bulb directly under the ship blazed, representing the explosion of the bomb. Then the light traveled along the wavy path beneath the water to the shore station and from there is flashed back to the ship.

Miniature Motion Pictures.—Each division in the Coast Survey selected a series of pictures from the files depicting various phases of its work, and these were displayed continuously by automatic projectors.

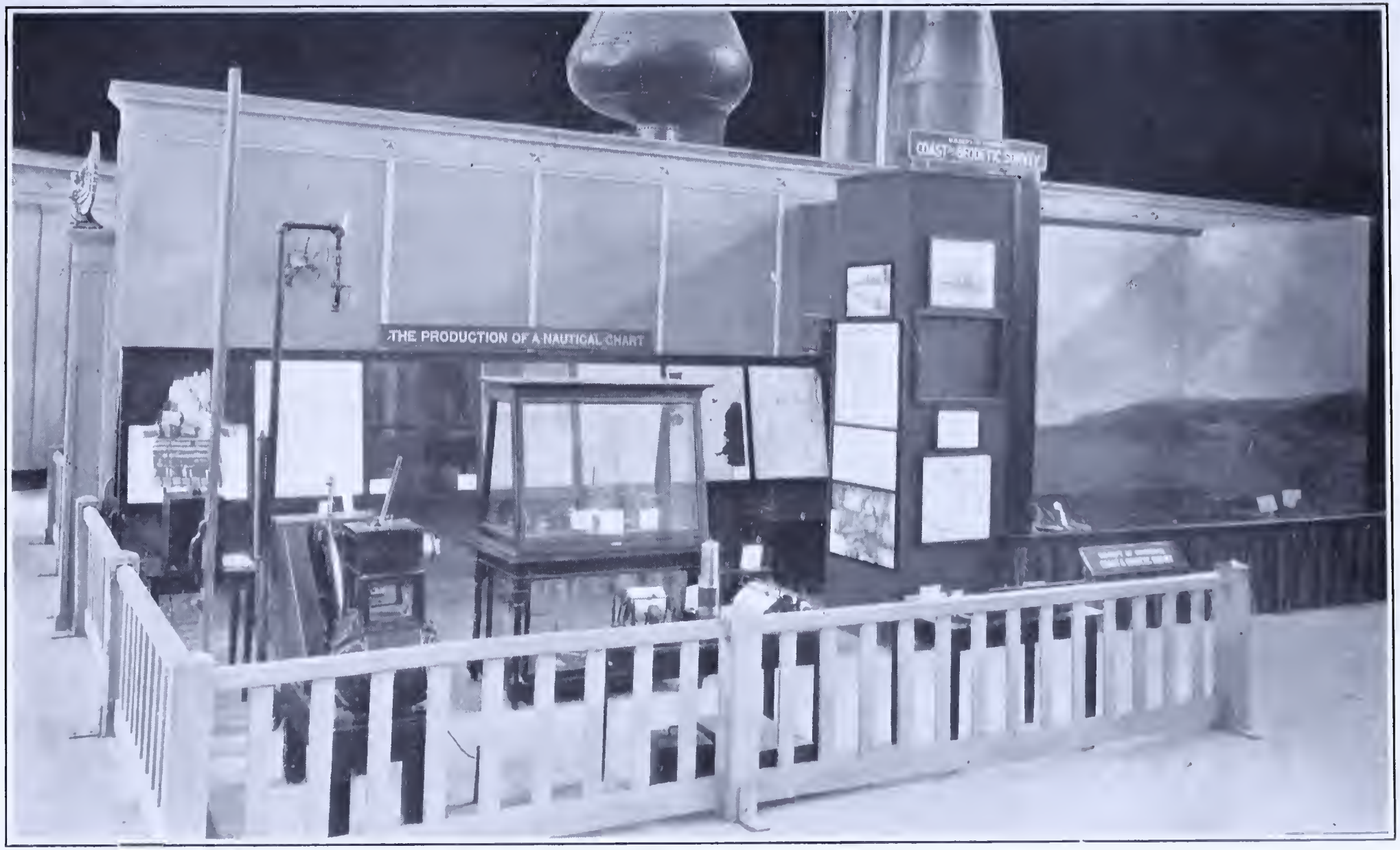

PLATE 210.—Nautical Chart, Coast and Geodetic Survey exhibit.

HYDROGRAPHY AND TOPOGRAPHY

The instruments and specialized equipment used in hydrographic and topographic work that were on exhibit were the following:

Plane Table Outfit
Hypsograph
Quartermeter Scale
Declinatoire
Hydrographic Sheet
Sextant
Protractor
Wire Drag Computer
Wire Drag Protractor
Wire Drag Buoy Spacer
Lead Line
Sounding Tube
Deep-sea Sounding Machine
Soundings have been made by this method in depths of six miles.
Detaching Rod
Sounding Shot
Water Specimen Cup
Deep-sea Thermometer
The temperature of the ocean bottom is only a little above freezing even in the tropics.
Fathometer

GEODESY

The specialized equipment used in geodetic surveying included the following:

Twelve-inch Theodolite
Automatic Signal Lamp
Chronograph
Astronomic Transit
Zenith Telescope
Precise Level

TERRESTRIAL MAGNETISM AND SEISMOLOGY

The specialized equipment used in terrestrial magnetism and seismology were the following:

Field Theodolite Magnetometer
Earth Inductor and Galvanometer
Dip Circle
Compass Declinometer

TIDES

The instruments shown that are used in measuring the rise and fall of the tides were as follows:

Standard Automatic Tide Gauge
Portable Automatic Tide Gauge

CHARTS

Included in the chart display were the following:

Production of the Nautical Chart (Plate 210)
Display of modern charts, Coasts Pilots and other information
Bench Marks and Station Marks

PLATE 211.—The Pool, Bureau of Fisheries.

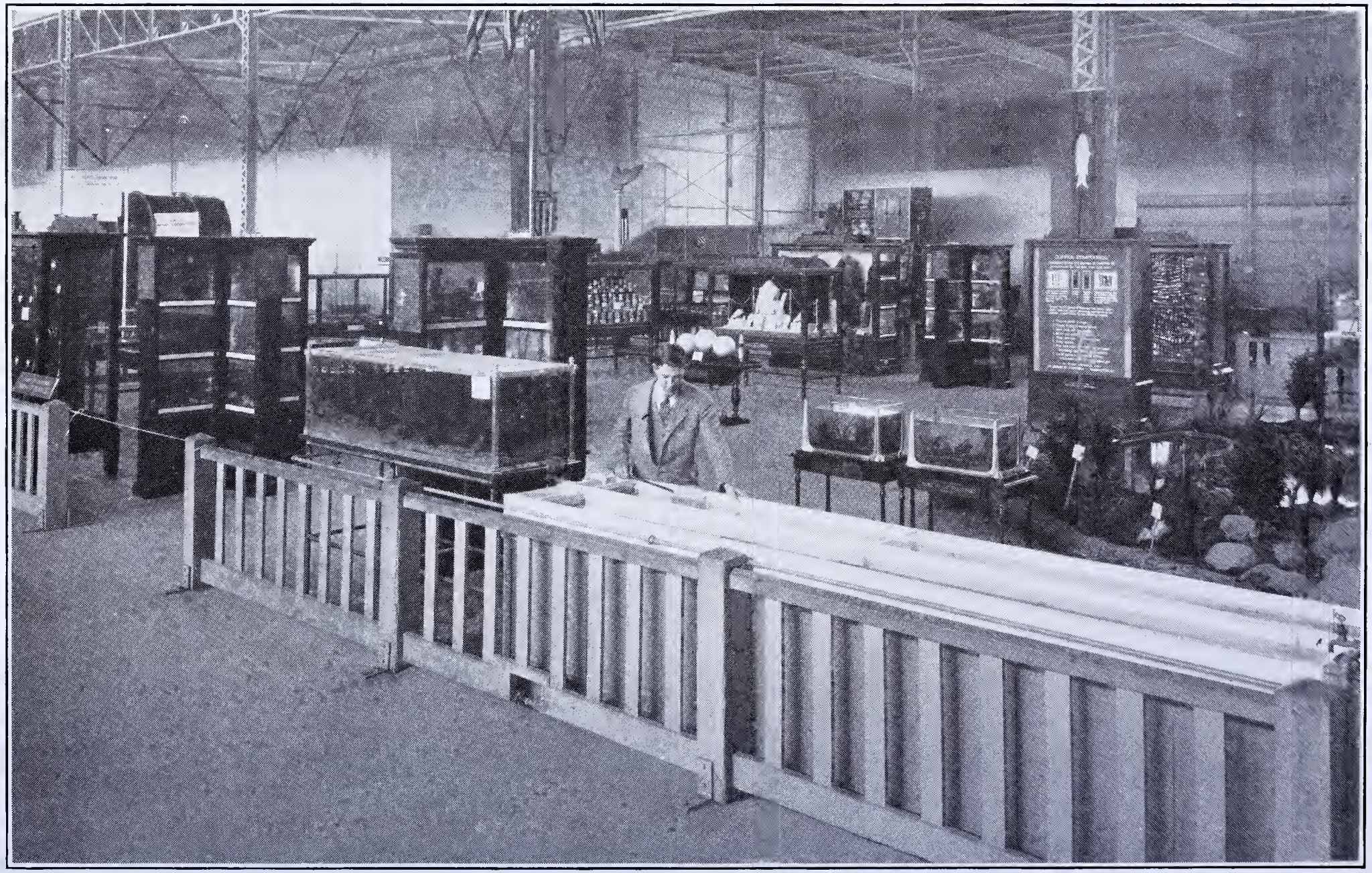

PLATE 212.—The hatching troughs and acquaria, Bureau of Fisheries.

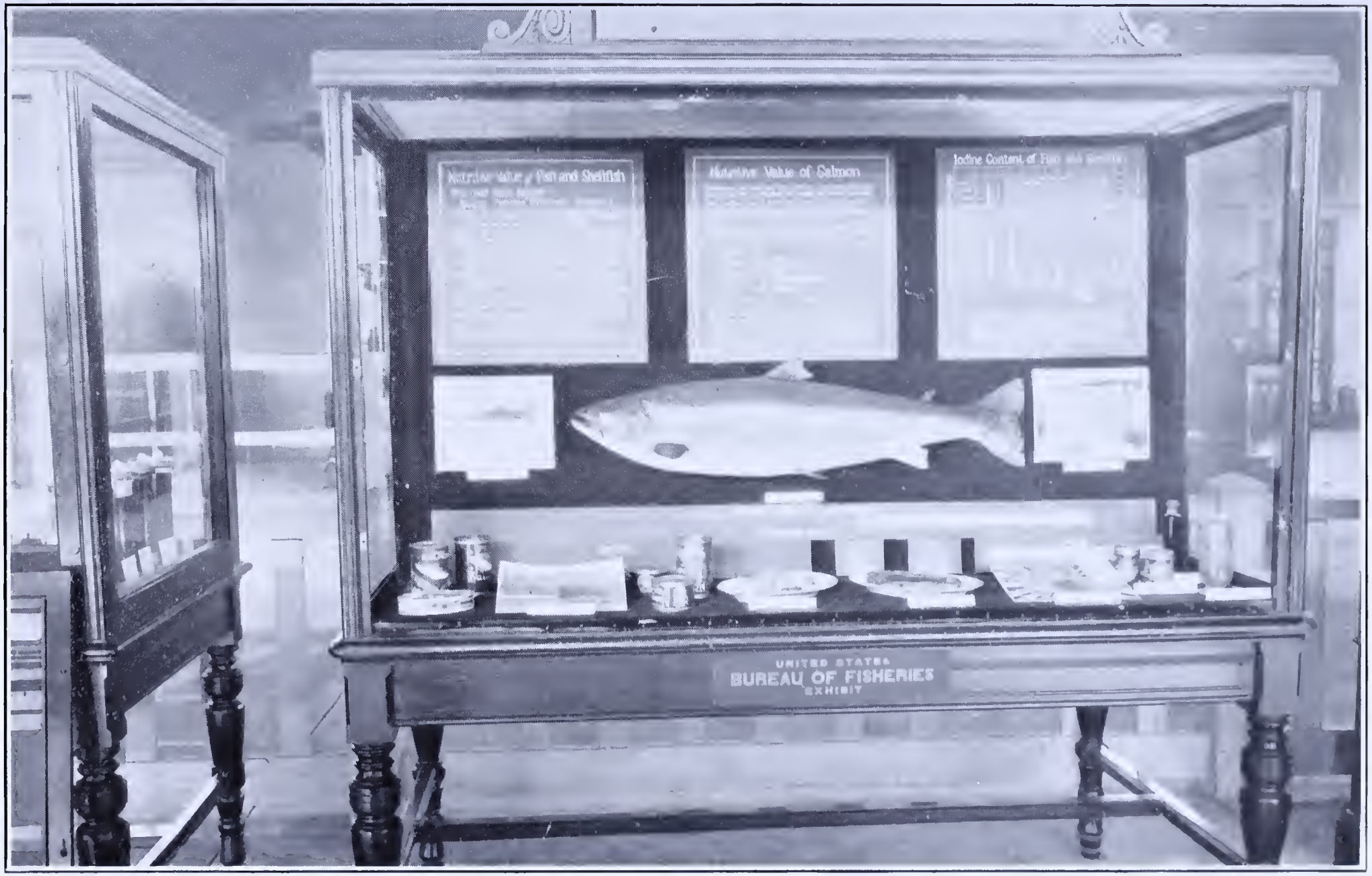

PLATE 213.—Food Fishes—"The salmon."

The Bureau of Fisheries

The Bureau of Fisheries performs an important service in aiding, fostering, and perpetuating the nation's fishery resources. Its exhibit occupied a space fifty feet by sixty feet in the northwestern section of the Department of Commerce area, and served as an illustration of the progress of the fishing industry in the economic utilization of these fishery products and by-products. The majority of the individual displays were enclosed in large plate-glass cases which were placed along the three outer edges of the Bureau's space, and three glass top table cases were arranged within the area so enclosed. An oval rock-rimmed fish pool, stocked with fresh-water fish, and having a large oil painting as a background occupied the center portion of the fourth side of the Bureau's space, this painting being mounted on the partition separating the Bureau from the adjoining exhibit. (Plate 211). To the right of this were two hatching troughs and three aquaria stocked with rare species of goldfish. (Plate 212). In the very center of the exhibit was placed a mechanical device consisting of three large iridescent pearls which ingeniously displayed fish-scale essence in motion.

Transparencies illustrative of the general activities of the Bureau were displayed in specially constructed cases, two of which occupied the spaces on either side of the main entrance and the third at the entrance on the opposite side.

USES OF FISH AS FOOD

The fishery resources are primarily important as a source of food and various displays revealed the importance of fish in the diet and the forms in which it may be purchased.

Nutritive Value of Fish (Salmon).—This was portrayed by charts dealing with the following: nutritive value of fish and shellfish; nutritive value of salmon; iodine content of sea foods; total catch of salmon; and the amount entering commerce as canned, cured, fresh, and waste. Four illustrations, 8 inches by 10 inches depicted the Alaska salmon industry; a model of a salmon steak showed the method of cooking fresh salmon and a model of creamed kippered salmon showed the method of cooking cured salmon. The prepared products of salmon were shown by canned salmon and caviar of various sizes and grades. Salmon oil, salmon meal, and a jar of salmon eggs used for bait illustrated several of the by-products of the salmon. (Plate 213).

Nutritive Value of Shellfish—(oysters and shrimp).—This was portrayed by charts dealing with the nutritive value of oysters and shrimp and the total catch of shrimp and oysters and the amount of each enter-

PLATE 214.—Nutritive value of oysters and shrimp in diet and commerce.

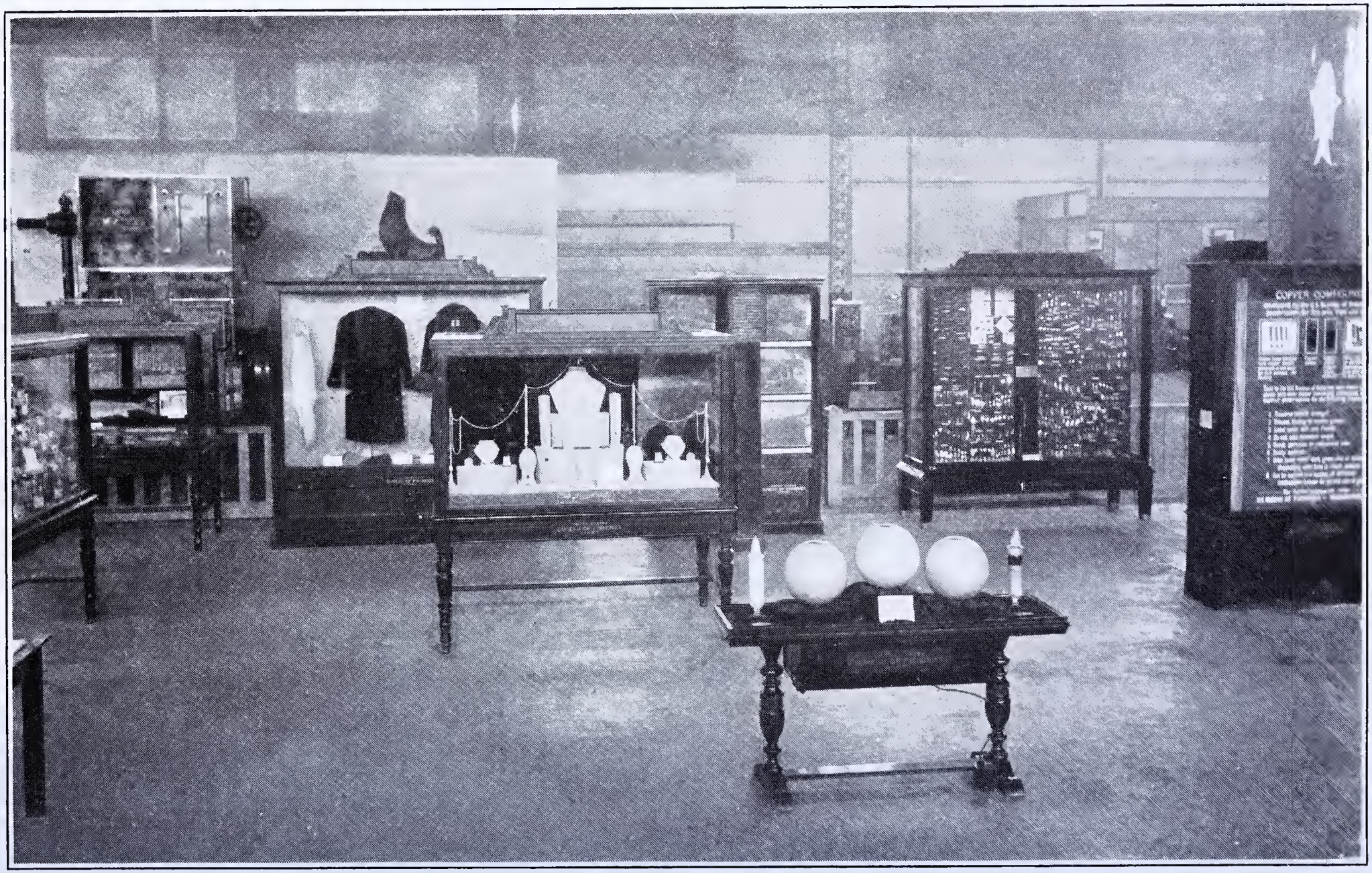

PLATE 215.—Artificial pearl exhibit.

ing commerce as canned, fresh, and waste. Three illustrations 8 inches by 10 inches depicted the oyster industry and three illustrations of the same size depicted the shrimp industry. A model of six oysters on the half shell showed one method of using fresh oysters and a model of a shrimp salad showed one method of using fresh shrimp. The prepared products of the oyster were shown by several hermetically sealed packages of canned oysters, and the prepared products of shrimp by several hermetically sealed packages of shrimp. Lime and poultry grit illustrated several of the by-products of the oyster, while shrimp bran showed a by-product of the shrimp. (Plate 214).

Hermetically Canned Fishery Products.—Included in this display were canned trade fishery products from every section of the United States and Alaska. Cans were arranged in a step pyramid according to the sizes of the cans and the color of the label. Over three hundred samples of canned products, such as caviar, clam chowders, clams, sardines, cod, eels, haddock, mackerel, mussels, oysters, salmon, shad, shrimp, squid, tuna and whale, were shown in packages of many sizes and descriptions.

Mounted Specimens of Food Fishes.—In this display were included 11 species of edible food fishes found in the waters of the Atlantic and Gulf coasts of the United States.

USE OF FISHERY PRODUCTS AND BY-PRODUCTS IN THE ARTS AND INDUSTRIES

The by-products of the fisheries at present are valued at $14,000,000 and are becoming more important each year. There were various displays to illustrate the marked progress in the use of such products.

Fish Scale Essence.—A product derived from the scales of fish—was shown by three large transparent glass spheres, filled with an agitated suspension of fish scale essence producing the effect of large lustrous pearls. (Plate 215).

Artificial Pearls Made of Fish Scale Essence.—Various articles of commerce in the manufacture of which fish scale essence was used. Included were pearl necklaces, pearls set in finger rings, and pearl scarf pins.

Artificial Mother-of-pearl made of Fish Scale Essence.—In this display were included various trade articles in the manufacture of which fish scale essence was used to produce the effect of mother-of-pearl. The following articles were shown: five hand-mirrors, the backs of which were made of artificial mother-of-pearl; a dresser set, including trays, powder boxes, comb, hand-mirrors and the like, the backs of each article being coated with artificial mother-of-pearl, and two cards of buttons coated with fish scale essence.

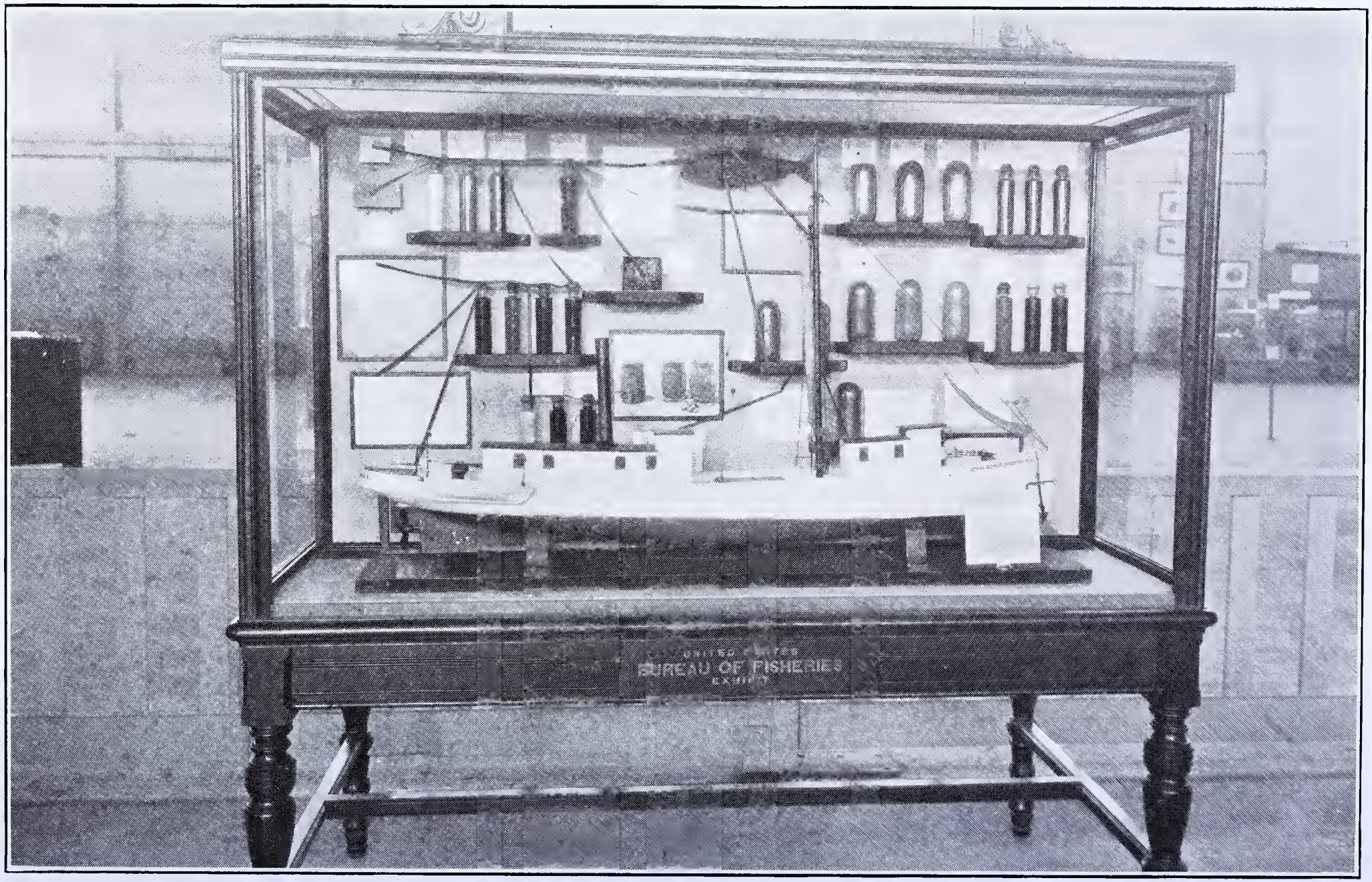

PLATE 216.—The "Menhaden" industry.

Alaska Fur Seal and Fox Industry.—The Department of Commerce, through the Bureau of Fisheries, exercises control over the Alaska fur seal and fox industry. A display of this work included an Alaska fur seal skin showing the processes of manufacture from the natural to the finished fur; five fur seal skins dyed various shades; a stuffed fur seal with two pups; a chart showing the migrations of the fur seal herd on the Pacific Ocean and four fox pelts. The industry was illustrated by the following colored transparencies (each 16″ x 20″) as follows:

Fur Seals, chiefly three-year-old males, Pribilof Islands, Alaska. From the surplus of this class most pelts are secured by the Government.

Fur Seals on shore and playing in water, Pribilof Islands, Alaska.

Fur Seal Harem. Breeding group of cows and breeding bull in background, Pribilof Islands, Alaska.

St. Paul Village. Residences of officials and Aleut natives. Also native Russian Greek Church, St. Paul Village, Pribilof Islands, Alaska.

Murres congregate in vast numbers each summer at the Pribilof Islands, Alaska. The eggs are eaten by the natives and the birds furnish food for foxes.

Blue Fox herds in winter on Pribilof Islands, Alaska. From these herds about 600 pelts are obtained each year.

Fish Oil, Meal and Scrap, and Their Use in Industry.—This display placed emphasis on the menhaden industry and bottled samples of menhaden oil were shown. Trade products using menhaden oil in their manufacture, such as soaps, paints, tanned leather, enameled leather, oil cloth, linoleum, cold cream, and others were shown. Various grades of menhaden fish meals were also shown and their use for feeding stock and for fertilizer. (Plate 216).

Cod-liver Oil and Its use in Medicine.—The stages of manufacture from the raw cod livers to the commercial bottled cod-liver oil were shown and an illustration of cod-liver oil in curing rickets disclosed the use of cod-liver oil for medicinal purposes.

Glue from Fish Skins and Its Use in the Arts and Industries.—The manufacture of glue from fish skins was illustrated by a whole cod skin and sections of other dried fish skins. The original equipment perfected in 1873 for making glue from fish skins was also shown. A photo-engraved plate, as an adhesive in mending wood, leather, and other articles and in making gesso work on bowls illustrated the use

PLATE 217.—Original apparatus, for making glue from fish skins, perfected in 1873.

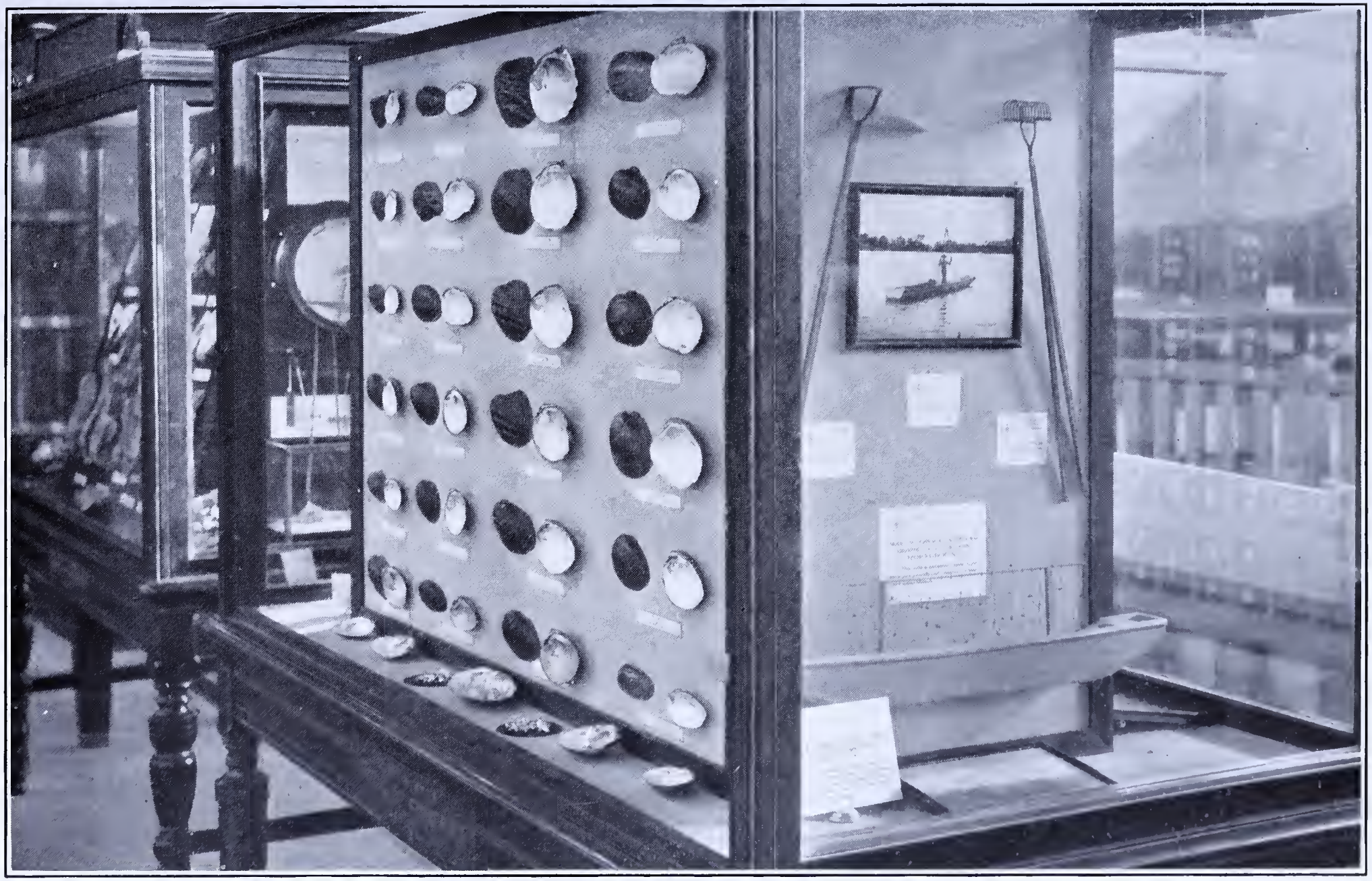

PLATE 218.—Fresh water mussel shells and apparatus used in the industry.

of fish glue. A poultry food obtained from the residue after the glue stock is removed from the fish skins was also shown. (Plate 217).

Shark Fishery.—The utilization of sharks was shown by a display of shark leathers and manufactured products such as shoes, brief cases, pocket books and slippers, samples of dried shark meat, dried shark fins and oil, were also included.

Fresh-water Mussel Shell Industry.—This display consisted of various species of fresh-water mussel shells and mother-of-pearl buttons and novelties made from such shells. Models of a dip net; shell tongs or scallop forks; "John-Boats"; and a crawfoot bar outfit, demonstrated the methods of capturing the fresh-water mussel. The processes of manufacture were illustrated by twelve photographs. Photographs also illustrated the method of propagating fresh-water mussels as practiced by the Bureau of Fisheries. (Plate 218).

USE OF FISH FOR SPORT AND RECREATION

The Bureau of Fisheries operates thirty-five principal and sixty auxiliary fish hatcheries throughout the United States and annually distributes over five billion eggs, fry and fingerlings throughout the United States. A few phases of this work were shown.

Hatching Troughs.—Two hatchings troughs demonstrated the method of hatching trout and salmon as practiced by the U. S. Bureau of Fisheries. (Plate 212).

Aquarium.—This consisted of a pool, 10 feet by 16 feet, surrounded by rocks, logs, and autumnal foliage and was stocked with varieties of fish propagated by the Bureau of Fisheries. An oil painting twelve feet by thirty-six feet served as a background. The painting was of a mountain and lake scene with a Bureau of Fisheries hatchery in the middle section, a cannery on the left, and an angler on the right, depicting the service of the Bureau of Fisheries in supplying fish for both the commercial fisherman and the angler. (Plate 211).

Balanced Aquaria.—Three balanced aquaria stocked with rare specimens of gold fish demonstrated their adaptability for home use.

Anglers Equipment.—Two displays showed modern rods, reels, lines, spoons, artificial baits, and other accessories used in fresh and salt-water angling.

Bureau of Fisheries Activities in Fish-Culture.—This display consisted of twenty-four colored transparencies (16 inches by 20 inches) as follows:

Salmon Leaping Falls. Many obstacles are encountered by the salmon on their migrations from the sea to the spawning

beds. They are able to ascend falls of 12 feet or more in height.

Salmon Hatchery, Yes Bay, Alaska. The Bureau of Fisheries handles about 133,000,000 salmon eggs, fry and fingerlings annually.

Stripping Cod Aboard Schooner. Bureau employees salvage millions of eggs of the cod, haddock and other marine fishes from the market fisherman. These eggs are fertilized and returned to water, or sent to hatchery.

Trout Hatchery at Wytheville, Va. In the foreground are shown the nursery ponds. At the various Bureau of Fisheries trout hatcheries, over 92,000,000 trout eggs, fry, and fingerlings are handled annually.

Trout Hatchery, Bozeman, Montana.

Stripping Rainbow Trout. The eggs are expressed from the female, fertilized and water-hardened before taken to the hatchery.

Stripping Whitefish on the Great Lakes. The whitefish are among the most choice fresh-water food fishes.

Hatching Whitefish Eggs. Whitefish eggs are hatched in jars arranged in batteries through which is a free circulation of water. The Bureau of Fisheries handles about 173,000,000 eggs and fry of the whitefish annually.

Preparing Eggs for Shipment to Bureau of Fisheries Hatchery. The eggs are carefully picked over to eliminate dead eggs, then measured and packed in shipping cases for distribution to other hatcheries and agencies for hatching and planting.

Trout Nursery Ponds, Wytheville, Va. Here trout are reared pending distribution to lakes and streams.

Bass Ponds, Bureau of Fisheries Hatchery, Wytheville, Va. Removing vegetation from a pond in which the growth has become too dense. The square box-like enclosures are bass nests in which the bass are hatched.

Bass Ponds, Orangeburg, S. C. The Bureau of Fisheries plants over 3,250,000 fry and fingerling bass every year.

Commercial Gill Net Fishermen Catching and Stripping Shad. The shad fishermen on the Potomac River strip ripe shad and deliver the eggs to representatives of the Bureau of Fisheries who transport them to the hatchery for incubation.

Hatching Shad at Bryan's Point on the Potomac River. Millions of eggs are secured from the catch of the fishermen, incubated and released to save this fishery from depletion.

PLATE 219.—Biography and biology of the oyster, development of natural oyster beds and reefs.

U. S. Bureau of Fisheries Cooperative Fish Nursery, Harrisburg, Pa. Nursery troughs and ponds for the production of larger fingerling brook trout. Capacity 100,000 fingerlings.

Saving Stranded Fish. Rescuing fish from pools left after the flood waters in the Mississippi River have receded. About 100,000,000 fish are saved annually.

Transporting Rescued Fish. About 80 men are employed by the Bureau of Fisheries in saving these stranded fishes.

Inoculating Fish. Rescued fish before being released are inoculated with the young of the fresh-water mussels which are parasitic for a time. The fishes widely distribute the young mussels and help to maintain the mussel fishery.

Bureau of Fisheries Distribution Car. Distribution cars transport eggs, fry, fingerlings and rescued fishes to all parts of the country. These cars travel more than 75,000 miles and distribute about 5,000,000,000 eggs, fry, etc., every year.

Distribution by Motor Truck. Motor trucks distribute eggs, fry, and fingerlings from remote field stations or hatcheries.

Distribution by Pack Horse. Pack horses are used by the Bureau of Fisheries to distribute eggs, fry, and fingerlings to points which cannot be reached by other means of conveyance.

Planting Trout. Planting black-spotted trout in a stream where later they will be taken by some lucky angler.

Planting Fish in a Stream Far Away From Civilization. These fish are carried by pack horses over mountain trails to keep the streams stocked and provide sport for anglers.

Angling. It is estimated that 10,000,000 anglers fish our waterways each year. The Bureau is endeavoring to keep these waters stocked to provide good fishing.

BIOLOGICAL AND TECHNOLOGICAL INVESTIGATIONS

Biological, technological, and statistical data are essential for the proper development of American fisheries. To this end the Bureau of Fisheries employs a staff of biologists, technologists, and statisticians and maintains laboratories in various sections of the United States.

The Oyster Fishery.—Incorporated in this display were oysters from various sections of the United States and oysters showing development of natural oyster beds and reefs. (Plate 219).

Biological Apparatus.—Included in this display were two pieces of apparatus devised by Bureau employees to study the feeding of the oyster. A recording apparatus showed the duration of feeding and a measuring apparatus the amount of water filtered.

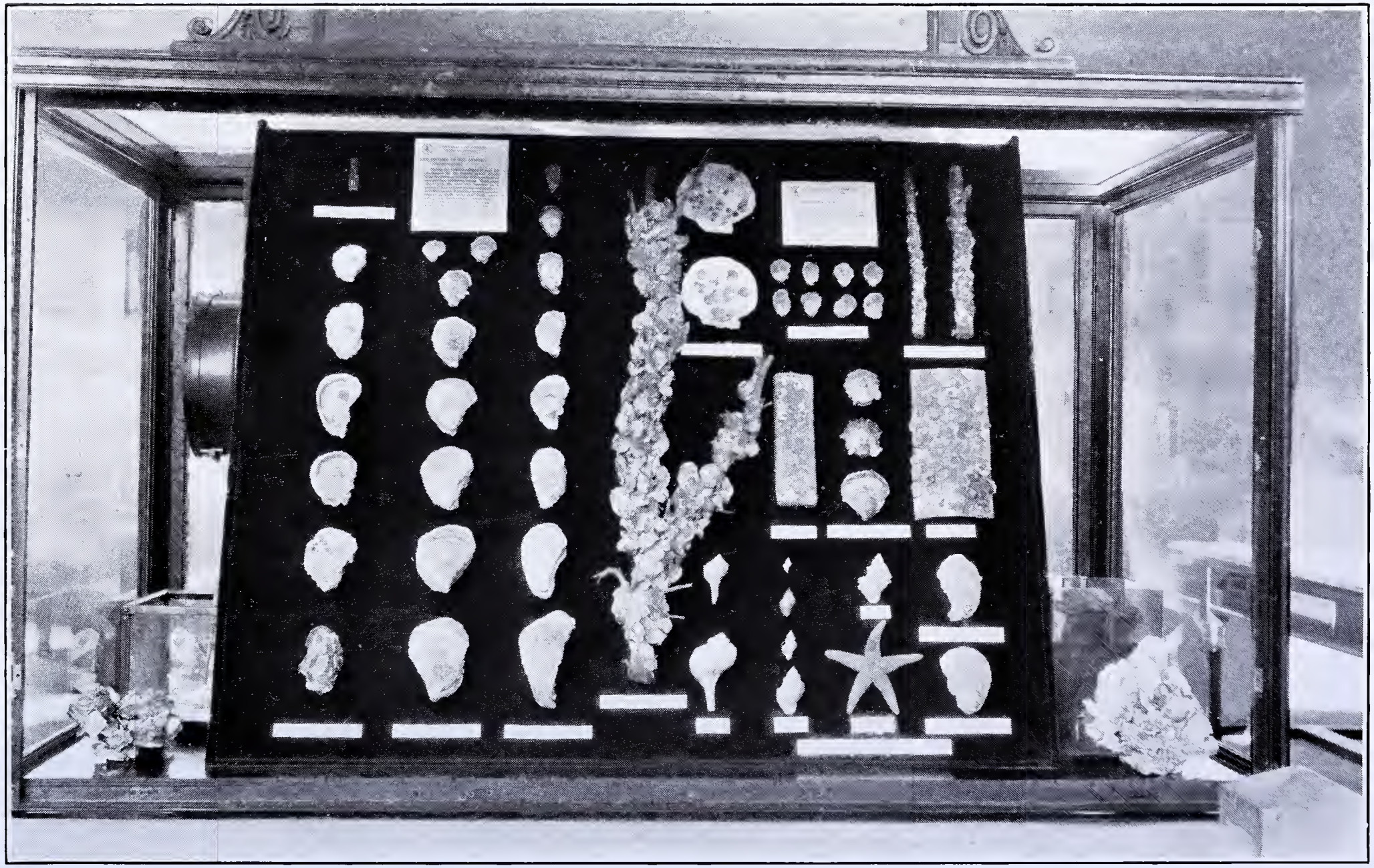

PLATE 220.—Life history of the oyster.

Life History of the Oyster.—The display depicted the growth of the oyster from the larvae to seven years on both hard and soft bottom. Oysters were shown attached to brush, shells, wood and tile collectors. Several enemies of the oyster such as conchs, drills, starfish, and the like were shown. (Plate 220).

Apparatus used in Oceanographic Investigations.—Instruments used by the Bureau of Fisheries in making oceanographic studies included thermometers, waterbottles, drift bottles, tagging instruments, and sounding machines. One of special interest, the Greene-Bigelow water bottle was devised by Bureau employees.

Marine Piling Investigation.—Woods chemically treated in various ways demonstrated the effectiveness of certain chemicals in resisting the entrance of marine borers. Included in the display were eight illustrations of various species of marine borers and two illustrations of wood piling impregnating apparatus.

Bureau of Fisheries Activities in Fishery Biology.—The display consisted of twenty-four colored transparent illustrations (16 inches by 20 inches) as follows:

U. S. Bureau of Fisheries Headquarters, Washington, D. C. Created in 1871 to prosecute investigations and inquiries relative to the diminution of food fishes, its causes and remedies.

Henry O'Malley. Commissioner of Fisheries.

Lewis Radcliffe. Deputy Commissioner of Fisheries.

Fisheries Biological Station, Woods Hole, Mass. The center of biological research of the North Atlantic Fisheries since 1871.

Tagging Codfish. This reveals many important points regarding their habits, migrations and rate of growth.

Catch of Cod and Halibut. Taken by one of the Bureau's vessels in their search for new fishing grounds.

Fisheries Biological Station, Beaufort, N. C. Center of Fisheries Research in South Atlantic States.

Removing Newly Hatched Terrapin From Laying Beds. The Bureau of Fisheries has developed a practical method for terrapin farming.

Mosquito Control. Extension of the use of small fish (top minnow) in helping to eradicate mosquito larvae from stagnant areas in the southland.

Fisheries Biological Station, Fairport, Iowa. Center of investigations of fresh-water mussels and fishes.

Inoculating Fish With Mussel Larvae. These are parasitic on fishes for a short period, later deserting their host to form

colonies of their own. Investigations by the Bureau have saved important mussel fisheries from exhaustion.

Houseboat and Barges Loaded With Mussel Shells. The annual harvest is manufactured into buttons and other products valued at $7,500,000.

Fish Pathologist. He conducts highly important investigations in the rearing of fishes, their food and diseases.

Treating Diseased Fish. One method of saving fish infected with parasites is to dip them in toxic solutions.

Farm Ponds. The Bureau of Fisheries encourages the growing of fish in farm ponds and aids in increasing production.

Salmon on Spawning Grounds. The Bureau of Fisheries has conducted exhaustive investigations concerning the life history and habits of the salmon to insure the maintenance of this important industry.

Tagging Salmon. This method of tracing the life of the salmon yields valuable information for proper regulations of the fishery.

Brailing a Salmon Trap. The most important means of capturing the salmon in Pacific Waters.

Scientific Oyster Research. Researches by the staff of the Bureau of Fisheries are conducted to perfect oyster farming on a huge scale.

Brush Planted by Investigators of the Bureau of Fisheries. This brush was planted to secure oyster set in Connecticut waters under adverse conditions.

Texas Oyster Reef. Reef exposed at low tide from which oysters are gathered for the canneries. Investigations disclose means of building up oyster reefs in barren areas.

Georgia Oyster Reef. This reef shows growth of generation upon generation. Proper methods of transplanting oysters prevent over-crowding and improve their quality and quantity.

Tonging for Oysters. This is an important means of livelihood for many fishermen from Cape Cod to Texas.

Boat Load of Oysters. Our annual catch of market oysters amounts to about 18,000,000 bushels, furnishing us with 62,000 tons of a most delectable sea food.

Bureau of Fisheries activities in Fishery Technology and Statistics. The display consisted of twenty-four colored transparent illustrations (16 inches by 20 inches) of the following:

Statistical Section of the U. S. Bureau of Fisheries. Our annual harvest of water products is about 2,900,000,000 pounds

for which the fishermen receive $97,000,000. The Bureau collects statistics for biological and trade use.

Fishery Products Laboratory Building, Washington, D. C. In which fisheries, technological and chemical researches are made.

Experiments in Improving Methods of Handling Fresh and Frozen Fish. Made in the Bureau's Fishery Products Laboratory.

Fisheries Products Laboratory of the U. S. Bureau of Fisheries. This includes an excellent chemical laboratory where important scientific investigations are conducted.

Treating a Net to Lengthen its Life. The Bureau of Fisheries has demonstrated the value of copper compounds as most efficient preservatives.

Hauling Seine. Horse power is still used to haul the beach seines used for catching shad and herring in the Potomac River. A Bureau employee is present to salvage the eggs of the ripe fish.

Preparing Sardines for Canning in Fishery Products Laboratory. By a superior method developed by the Bureau of Fisheries. Annual pack of sardines is valued at $13,000,000.

Unloading the Silver Hoard of Sardines at Cannery. The fishery is centered in California and Maine.

Scaling Machines. Sardines are unloaded into a revolving drum to remove the scales.

Machines are Now Used for Cutting and Cleaning the Fish (Sardines). They do the work much more expeditiously than it can be done by hand.

Preparing Sardines. Sardines are brined, partially dried, and then placed in baskets for frying in oil.

Hundreds of Women Pack These Choice Fishes into Cans. Sauce or oil is added, then the cans are sealed, cooked, and sterilized.

Fishery Products Laboratory in the U. S. Bureau of Fisheries, Washington, D. C. It is excellently equipped for experimental work in utilizing the waste products of the fisheries.

Menhaden Steamer at Factory. Marine leg-elevator lowered to unload fish.

Bunting up the Catch. Fishing gear used by our fishermen is valued at $14,000,000. Improvements in preserving it, lengthen its usefulness.

Brailing Menhaden from Net Into Hold of the Steamer.

Menhaden Factory in Operation. Buildings from left to right are storage buildings for dry scrap, oil separating tanks, press room, green room and boiler house.

Pile of Oyster Shells. These are ground into poultry grit and lime and some returned to oyster beds. 225,000 tons are produced each year.

Freezing Salmon Singly on Refrigerated Coils. About 12,000,000 pounds are frozen annually.

Glazing Frozen Fish. Freezing conserves fish in time of scarcity. We freeze nearly 100,000,000 pounds annually.

Drying Salted Cod for Export. This product is widely distributed in world markets.

Boston Fish Pier. This is the largest and most modern wholesale fish market in the United States. One of the largest fish freezers is shown in the foreground.

Halibut. A highly prized food fish attaining a weight of 700 pounds.

Swordfish. An important food fish ranging up to sixteen feet in length and seven hundred pounds in weight.

Retail Fish Market. Such a market as this helps materially in increasing the popularity of fish as food.

Boat Models.—The display illustrated the evolution of the fishing craft from 1770 to 1926, and included models of the following boats:

1770—Marblehead cod fishing schooner
1848—New England cod fishing schooner
1865—New England market schooner
1886—U. S. Fisheries schooner *Grampus*
1926—New England fishing schooner *Mayflower*
1926—New England steam trawler

Implements.—This display contained knives, and various pieces of apparatus used in the New England Fisheries.

Copper Compounds as Net Preservatives.—This display was arranged as a chart and disclosed the use of copper compounds as a net preservative as developed by technologists of the Bureau of Fisheries.

Statistical Charts.—These were prepared from data collected by Bureau of Fisheries statisticians. One summarized the Fisheries of the United States and another the eggs, fry, and fingerlings distributed by the hatcheries of the United States.

Delineascope.—This displayed illustrations of the Alaska salmon industry, the oyster industry and the New England fisheries.

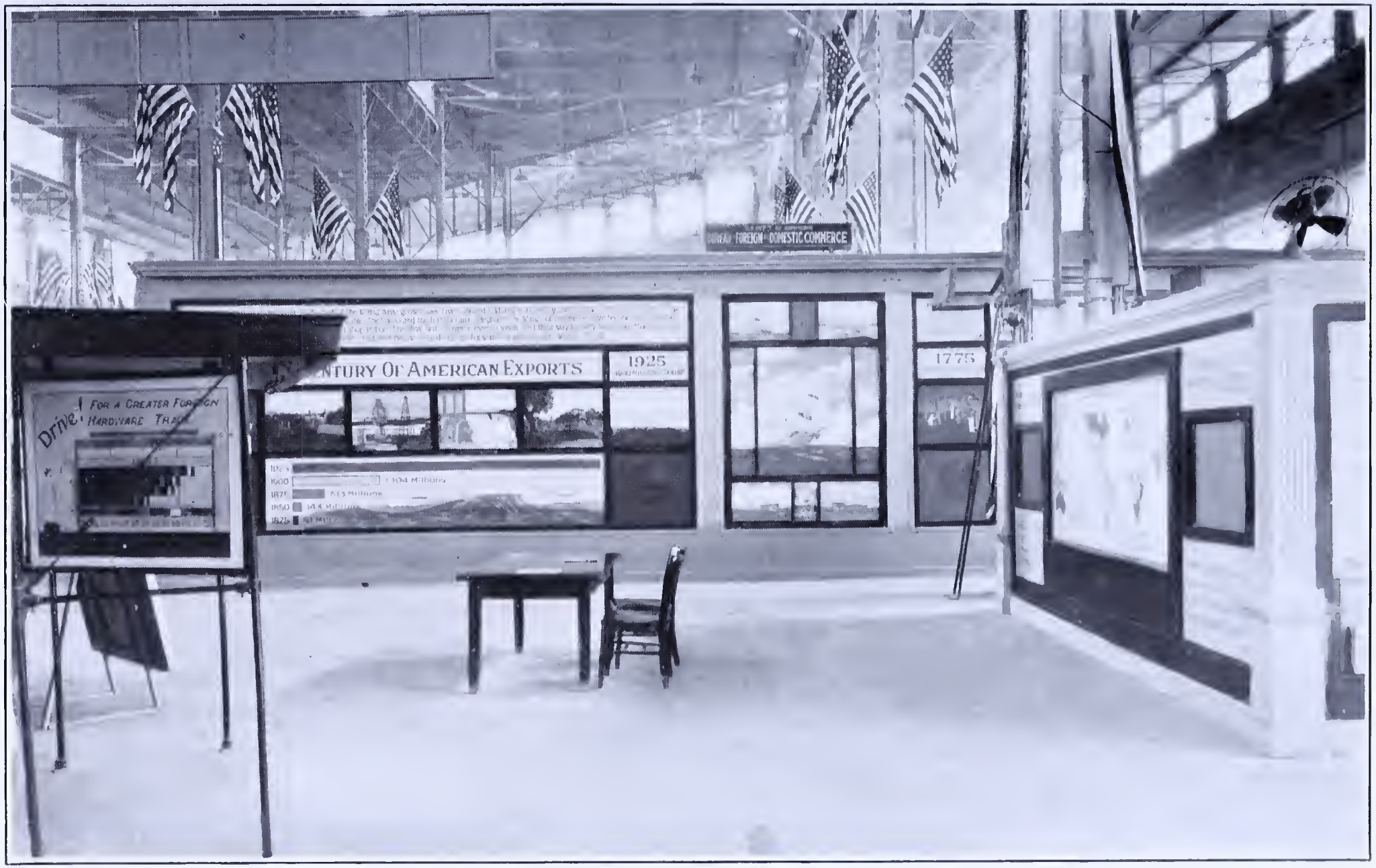

PLATE 221.—Ground glass map of the world and charts of Bureau of Foreign and Domestic Commerce.

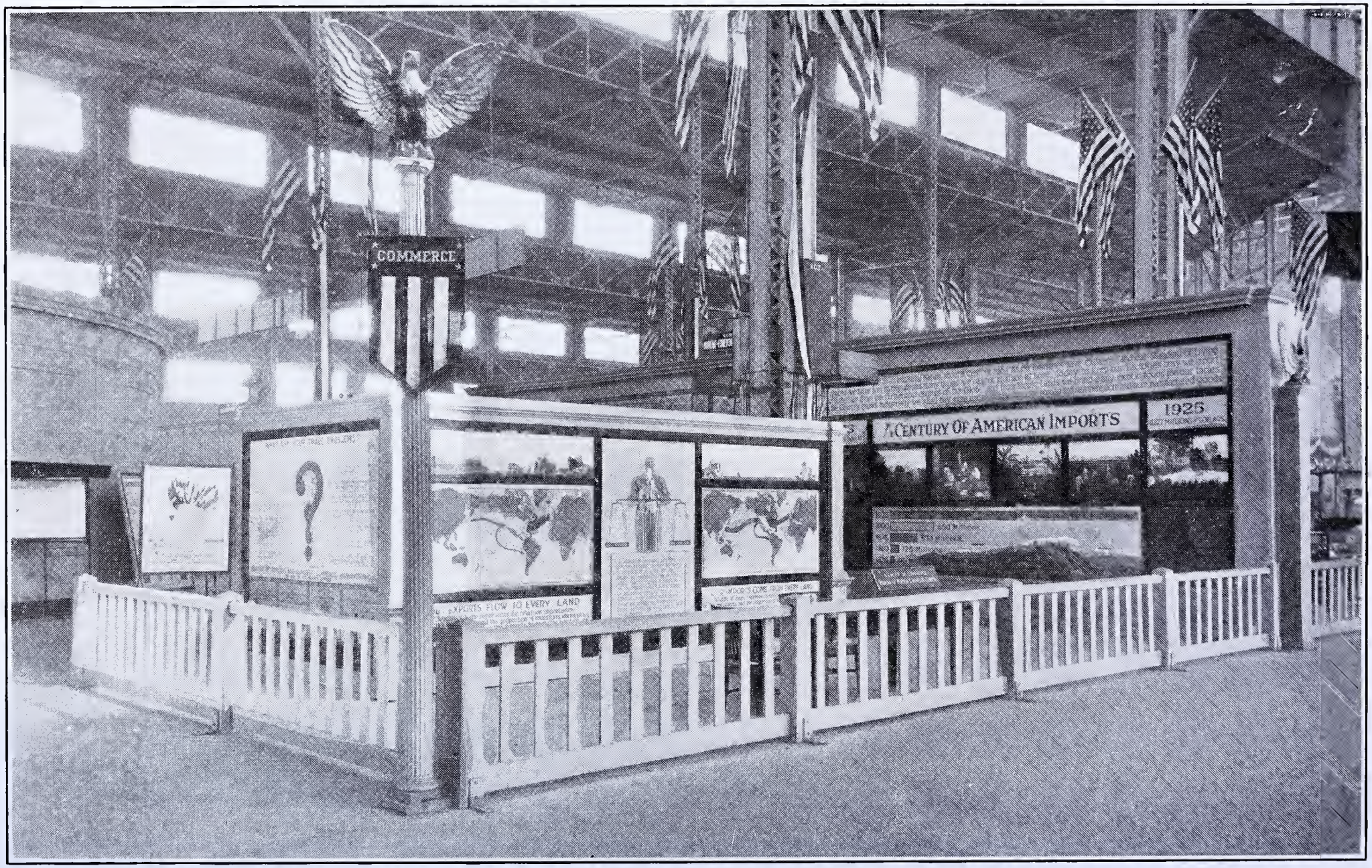

PLATE 222.—Map charts, showing flow of commerce, imports and exports.

Bureau of Foreign and Domestic Commerce

The exhibit of this Bureau placed before the public the story of the services that it renders to the business world and is ready to extend to additional American firms in both the foreign and domestic markets.

A rectangular booth, the partition wall, and swing-wing displayers furnished the surfaces necessary to exhibit the pictures, charts and maps of the Bureau.

Facing the central gallery of the Department exhibit from an outer wall of the booth was a large map of the world (Plate 221) on ground glass illuminated by lights from behind and controlled by an electrical device, which analyzed the United States in its relation to the rest of the world. It brought out the foreign and domestic offices, "Beacons of Business," of the Bureau, and explained how valuable commercial information is obtained by experts in the field and transmitted to American firms through the District and Cooperative Offices.

On either side of the map, small automatic motion picture machines showed uses of American products in foreign fields and conditions which the exporter may expect to meet.

On the opposite outer wall of the booth were two colored map-charts (Plate 222), one showed the types of exports and the countries buying them and the other depicted the imports and the countries from whence received. At one end of the booth were exhibited samples of the publications put out by this Bureau through the efforts of its experts in the field and the consular offices of the Department of State. These publications ranged from the small Trade Information Bulletins to the large statistical volume, "Commerce and Navigation of the United States" and the "Commerce Yearbook." On the opposite end from the publications was a list of questions which revealed the typical problems presented to the Bureau. Beneath these questions were holders containing samples of literature going into the details of the functions and services of the Bureau of Foreign and Domestic Commerce.

The partition presented three groups of paintings, the left group historical commercial developments, the center group developments in vessel types, and the right group modern scenes of the sources of raw materials abroad. These illustrated the double story told by text and graphs and captioned as "A Century of American Exports" and "A Century of American Imports."

The paintings noted above were as follows:

In the center: Clipper Ship, 1859
Elizabethan Galleons, 1580
The "Clermont" 1807
The "Great Eastern" 1855
Modern Tramp Steamer, 1926

Left Wing: Eli Whitney's Cotton Gin of 1793
Threshing machine in operation
Discovery of Oil, 1859
Waterpower Development
Development of the Automobile
Development of Radio

Right Wing: Tapping of Rubber Trees
Gathering Coffee
Gathering Cocoanuts
Separating Silk Cocoons
Cutting Sugar Cane
Australian Wool

Illuminated Map.—Illuminated map of the world on ground glass, 51 7/8 inches by 103 3/8 inches, showing the foreign and domestic offices. (Commercial Attaches, Trade Commissioners, District and Cooperative Offices).

Panels.—A panel entitled—"What Are Your Trade Problems?" "Why Not Submit Them to the Bureau of Foreign and Domestic Commerce?" This panel showed the name of the commodity divisions and the name of the branch offices of the Bureau of Foreign and Domestic Commerce.

Panels.—A panel showing American Merchandise Exports and Imports.

Charts.—Two charts showing origin of Imports and destination of Exports.

Motion Pictures.—Export film: Machinery Division. Pictures and captions about 200. Exports film: Automobile Division. Pictures and captions about 250.

CHARTS AND DRAWINGS EXHIBITED ON SWING-WING DISPLAYERS

Description.—Chart showing U. S. exports by Great Groups, five year averages, and relative growth of U. S. Exports and Population, five year average. 1876 to 1925.

Chart Showing Growth.—Chart showing comparative growth of U. S. exports, imports and population, five year averages, and also

PLATE 223.—Corner view of the lighthouse exhibit.

value of U. S. exports and imports per capita, five year averages. 1876-1925.

Chart Showing Exports.—Chart showing exports of leading commodities pre-war and post-war averages.

Chart Showing Imports.—Chart showing U. S. imports of leading commodities pre-war and post-war averages.

Changes in Origin.—Changes in origin of imports by Great Regions. Bars represent per cent of total value of imports into U. S. 1876-1925.

Changes in Destination.—Changes in destination of exports by Great Regions. Bars represent per cent of total value into U. S. 1876-1925.

Distribution of Imports.—Percentage distribution of imports by classes. Bars represent per cent of total value into U. S. 1876-1925.

Distribution of Exports.—Percentage distribution of domestic exports by classes. Bars represent per cent of total value of exports from U. S. 1876-1925.

United States Exports for the calendar year 1925 were displayed on a series of maps on wing frames. Ninety-four subjects were enumerated.

Statement of the various features of the Exhibit of the Domestic Commerce Division with explanatory data.

Atlas of Wholesale Grocery Territories.—A six foot by eight foot map, on easel, in six colors showing 183 primary centers of wholesale grocery distribution in the United States and an outline of the territory served; the value of each area was indicated by color distinctions based on trading population. This map was based on the Division's latest survey of the same designation to be published in January.

Regional Market Surveys.—A six foot by eight foot map of the United States, on easel, and in colors showing the status of the Division's marketing research. The extent of each area to be surveyed was designated in the form of a progress chart; i. e., projected, actual survey work, published report, etc.

Summary of Published Research Reports.—A four foot by eight foot display board, on easel, with front page mats of each Division publication to show the scope of the work.

Bureau of Lighthouses

The exhibit of the Lighthouse Service covered the period from 1716 to 1926. and showed the progress made in the protection of life and property at sea, and in providing lights and other sea marks for the safety of navigation. (Plate 223). Boston Light, the first lighthouse in America, was lighted on September 14, 1716, and its 200th anniver-

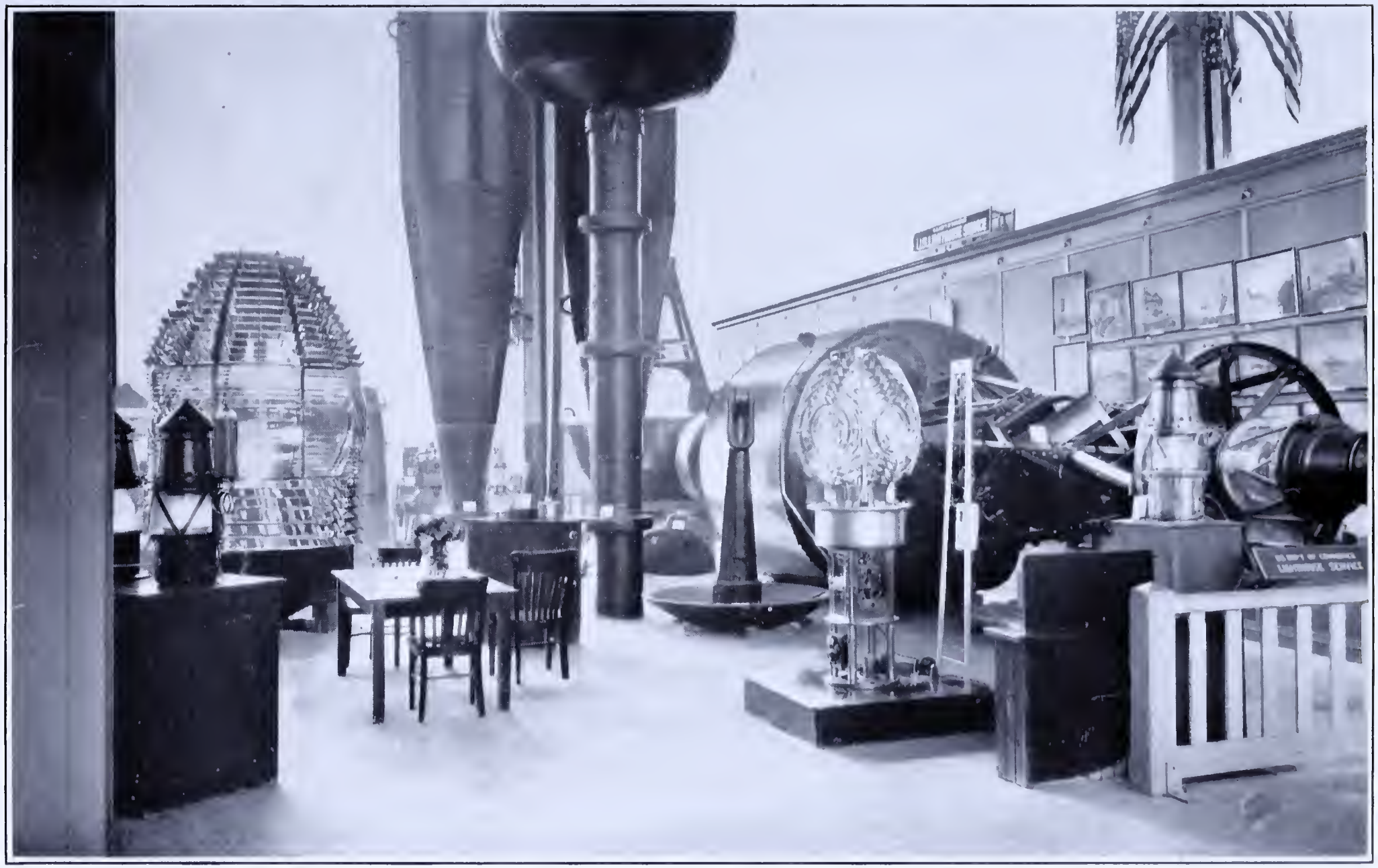

PLATE 224.—Buoys and lenses of Lighthouse Service.

sary was celebrated ten years ago. One of the first acts of Congress approved in August, 1789, provided for the maintenance of lighthouses. The service now maintains over 18,000 lights, buoys, fog-signals, and other aids to navigation, and is the largest organization of its kind in the world. It employs 6,000 persons, over 40,000 miles of coast line, has a fleet of 115 vessels, and 1,800 smaller boats, and is supported by an annual budget of approximately $10,000,000.

ILLUMINATING APPARATUS AND LENSES

The display of typical lighthouse lenses, contained twelve sizes, commencing with a massive first-order lens, six feet in diameter and ten feet high, composed of cut-glass prisms, with a three-mantle incandescent oil vapor light for its illuminant. The other types of lenses included those mounted on mercury floats, giving a practically frictionless rotation, also lenses adopted for electric illumination and for compressed acetylene gas. All of these types have been developed and designed by the engineering force of the Lighthouse Service, and many of the special devices have been constructed in its own shops.

FOG-SIGNAL APPARATUS AND MACHINERY

The display of typical devices for warning ships in fog, included an old fog gun, or cannon, cast in 1700 and first used in 1719; a fog-bell, struck by machinery and by electric power; a powerful, compressed-air, automatic, six-inch siren, audible over ten miles; and a radio-beacon transmitting panel for sending radio signals in fog, the latest development in the art, with an effective range of over 100 miles. This apparatus was also designed by the Lighthouse Service, and the bell and siren mechanisms were build in the service shops.

BUOYS

The display of typical buoys, began with an automatic gas and bell buoy, weighing twelve tons. This buoy was nine feet in diameter, thirty-two feet long, and carried an automatic flashing light sixteen feet above the water line, visible nine miles and burning three months without attendance. It also carried a 1,000 pound bell struck automatically by the motion of the sea. Other types shown included first class tall-type nun and can buoys, and automatic whistling buoy and several smaller types, for different classes of service. These buoys were all designed by the Lighthouse Service. (Plate 224).

PHOTOGRAPHS

On the partition separating the Lighthouse exhibit from the Geodetic Survey, there were over eighty photographic enlargements of

PLATE 225.—Overhead view of the Bureau of Mines.

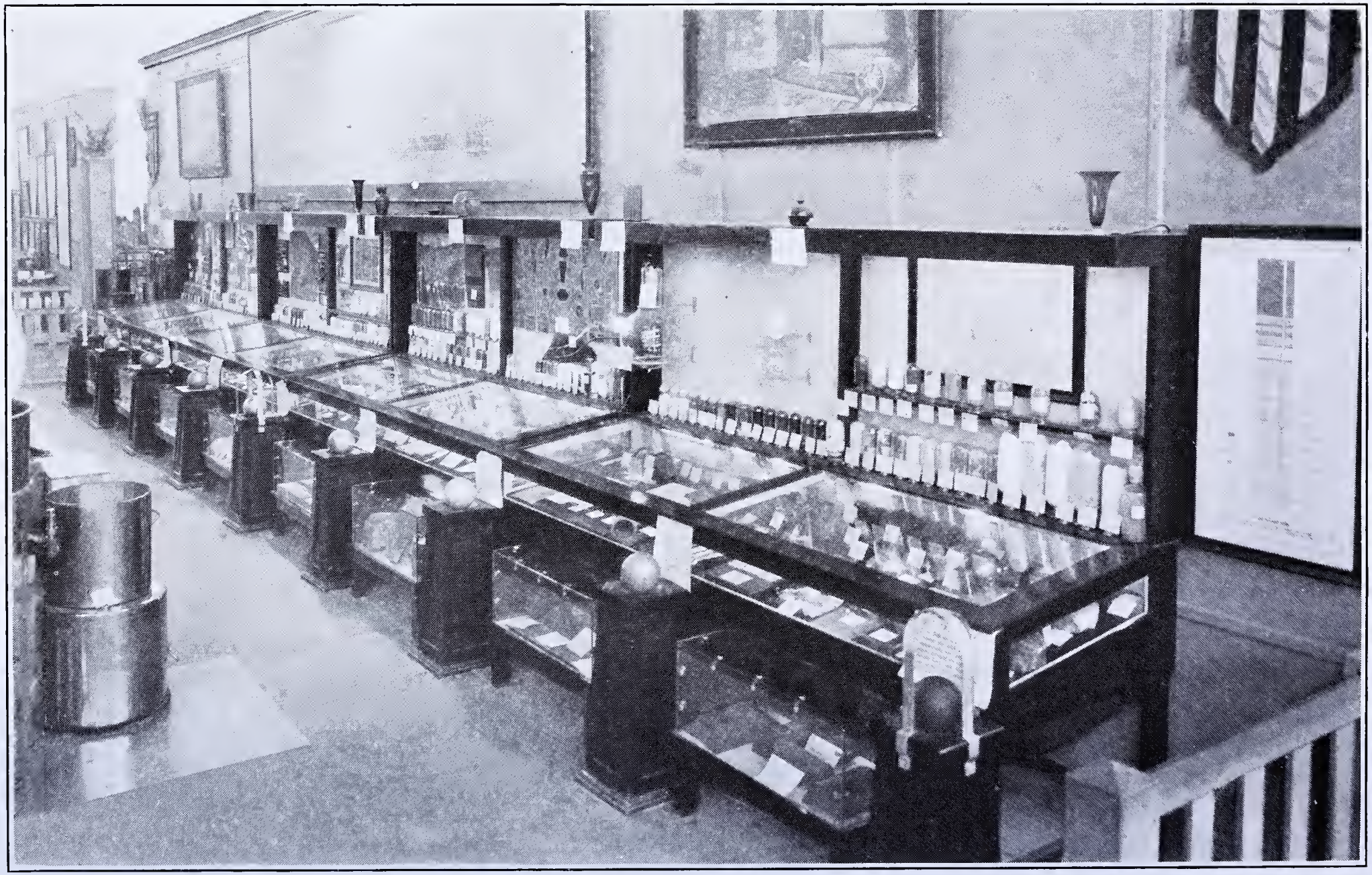

PLATE 226.—Overhead corner view of Bureau of Mines.

typical lighthouse vessels and structures, located on the Atlantic and Pacific Coasts, also the Great Lakes and the interior rivers, giving a general idea of the scope of lighthouse work.

Bureau of Mines

The Bureau of Mines exhibits were installed in a large rectangular area, 70 feet long and 50 feet wide, opposite the Bureau of Standards display, and separated from the Patent Office exhibit by a fixed partition. (Plate 225). Different sections were devoted to mineral technology, mine safety, and instruction and mine rescue work. Bureau of Mines Car Number 8, formed a separate exhibit on tracks at the west end of the building adjacent to the Railway Mail Car and other railroad displays.

In the center of the main exhibit there was a double structure, at one end simulating a coal mine entrance; at the other end was a glassed-in demonstration chamber for the first aid instructors. Approved types of mining machinery were placed in the mine mouth, or were arranged parallel to the two outer lines of the rectangle.

The section against the partition wall was devoted to exhibits of commercially pure and rarer minerals in various stages and forms. The details of the mineral technologic display are given below:

MINERALS ECONOMIC BRANCH

Metal Balls. These balls were cast or cut and polished into six-inch spheres from all of the common commercially pure metals and from some of the unusual metals. They included aluminum, antimony, cadmium, copper, iron (cast), iron (high purity), lead, magnesium, nickel, silicon, silver, tin and zinc, ranging from 7½ to 46 pounds in weight. The silver ball weighed 42¾ pounds and was valued at $450. The balls were so arranged on pedestals that the public could lift them, and observe the difference in their specific gravities. (Plate 226).

Electric Lamps. This display included the largest and smallest electric lamps made. The largest lamp requires 30 kilowatt at 115 volts and has a round tungsten filament. It is used with a reflector in the motion picture industry and has 100,000 candle power. Two other large lamps were also shown, one a 10 kilowatt lamp with ribbon filament, and a 5 kilowatt lamp with a wire filament. The smallest lamp, known as the "grain of wheat lamp," consumes one-fifth of a volt and is used by surgeons in investigation of the internal organs of the human body. A new lamp, the first time upon view to the public, was a small lamp for home use, consuming a negligible quantity of current. It has two parallel rods of magnesium instead of the usual tungsten filament. It gives a soft, rose colored glow and is used as a night lamp.

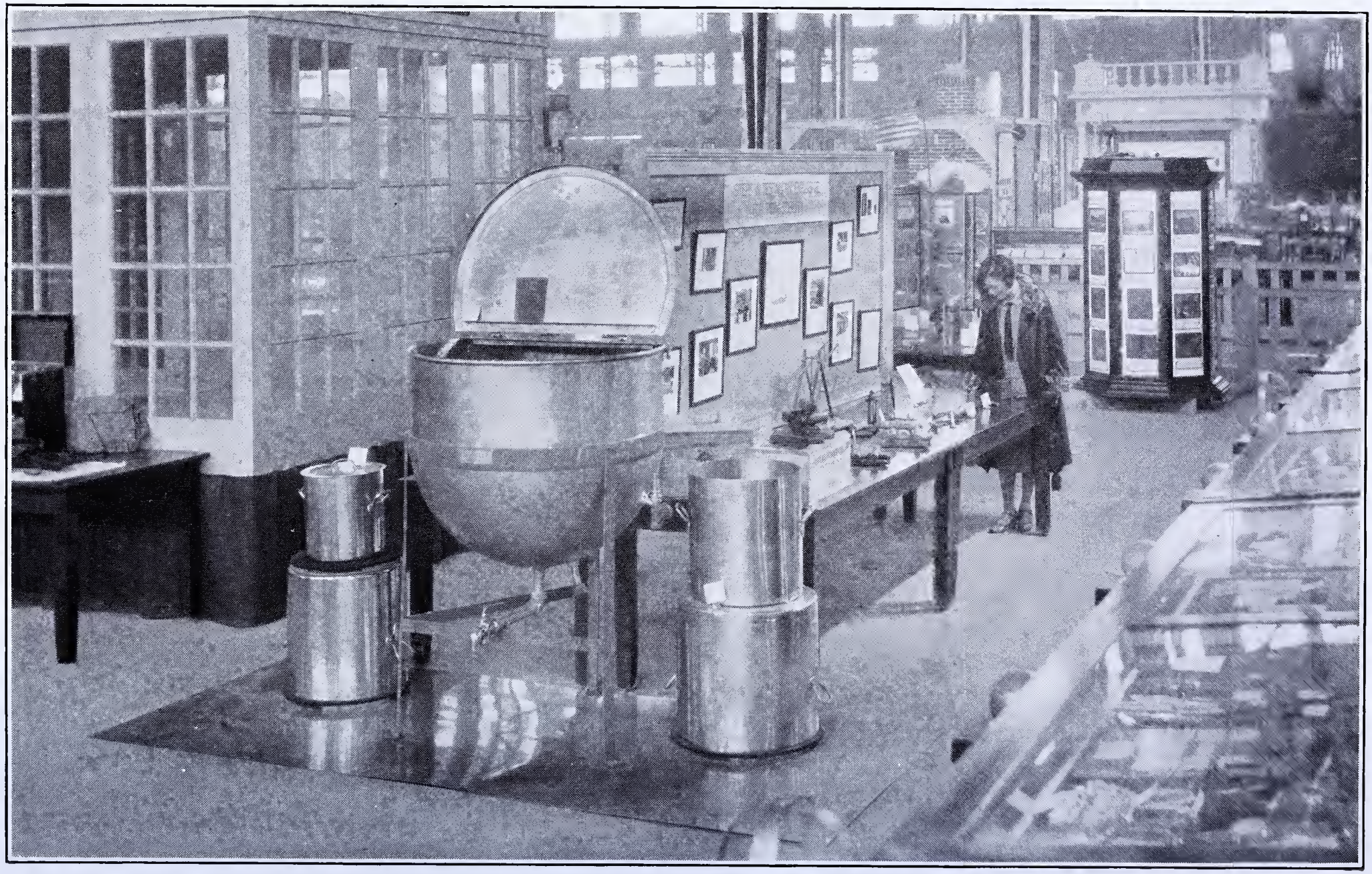

PLATE 227.—Pure nickel utensils—display of explosives and shot-firing devices on table.

Quartz and its Products. In this display is included crude Brazilian rock crystal and several finished quartz products, such as a 20 cc crucible; a 50 cc Erlenmeyer flask; a 6″ x 3″ crystal plate fabricated under the Miller process; several lengths of clear and opaque quartz rod and tubing; and an 18″ bent quartz rod which was so placed as to show the high transparency of the quartz rod to both light and heat rays. A small electric lamp placed at one end furnished the light. A photo-electric cell frame made according to the specifications of Kunz and Stebbins, and a 220 volt horizontal Uviarc lamp were also shown in this display. An image made by hand at Wu Chang in the province of Kiangsi, China, from rose quartz quarried in the Black Hills of South Dakota, was valued at $400 by the importers.

Glass Vases. A series of glass vases showing the use of different minerals for imparting colors to glass, were placed upon the top of the large cases for display.

Nickel Cooking Utensils. A large display of nickel cooking utensils included a kettle of 100 gallon capacity, welded and steam jacketed, used in dispensaries and canning factories, and other kettles ranging from a household size of 2 quarts up to 20 gallons. (Plate 227).

Diamond Core Drill. A diamond core drill which is to be used by the Bureau of Mines in the exploration for potash in New Mexico and southwestern Texas. The drill would take a core of 2½ in. in diameter and the core barrel had a capacity of six feet. The bit was studded with three internal and three external carbons (black diamonds). The core barrel revolved in a ball-bearing housing and was so constructed that it could be kept free from the drilling solution.

Rare Metals. The exhibit included a considerable number of rare and precious metals some of which have been very seldom on display. They included the three metals that are liquid at ordinary temperatures—mercury, caesium and rubidium, lithium, the lightest known metal, the specific gravity of which is only two-thirds that of water. Among the other unusual metals on exhibit were uranium, thorium, vanadium, barium, strontium, calcium, potassium, tantalum, bismuth, crystals, indium, germanium, gallium, beryllium and misch metal (an alloy of the rare earth metals contained in the mineral monazite after the removal of the thorium). The alloy is principally cerium, with a small quantity of lanthanum, didymium and others.

Ferro Alloy Metals. This display included ores and several finished and semi-finished products of the ferro alloy metals.

TUNGSTEN—Swaged rod, wires and a board containing various filaments used in the construction of electric lamps.

VANADIUM—Various vanadium ores, ferrovanadium, crystallized vanadium oxide (one specimen a beautiful flat radial mass of deep red

crystals about 3″ in diameter and the other of a plain nearly black mass of needlelike crystals), a piece of vanadium steel in the form of an oil pump gear similar to that used in Capt. Byrd's North Pole flight, and a collection of vanadium salts.

MANGANESE—Types of ore mined in the United States, several masses of ferromanganese, a large ferromanganese crystal and a board containing a cross section of a dry cell showing the use of manganese dioxide.

CHROMIUM—Ores from India and other countries and a large mass of ferro-chromium. The nickel-chromium alloy display included electrical resistance and heating wire and strips. Stellite (an alloy of nickel, chromium and other metals), knives, gages and other objects formed an attractive exhibit.

Common Metals. This display included ores and finished products of the more common metals, such as copper, lead, zinc, tin, nickel, aluminum and magnesium.

COPPER—The copper display included ores from the United States and Alaska. The products of the various steps from smelting to rolling were shown in small cases. They included blister copper; copper anodes and cathodes; wire bar; sections of square cake and round cake; flat bar; round bar and bus bar. A single crystal of copper which has a much higher electrical conductivity than ordinarily crystallized pure copper was included.

LEAD—The lead display included a large specimen of ore with crystals of galena (lead sulphide) imbedded in sphalerite (zinc sulphide) from Joplin, Missouri. Type metal, linotype metal and frary and other bearing metals, all alloys of lead, were shown in various forms. A section of underground telephone cable containing 1212 pairs of copper telephone wires incased in a lead tubing was shown.

ZINC—This display showed the various types of zinc ore. Zinc and galvanized products such as bolts, corrugated iron, boat fixtures, chain, spikes, and pulleys were shown.

NICKEL—The nickel display showed ores mainly from the Sudbury District of Northern Ontario, Canada. Various types of anodes and cathodes for use in nickel plating, nickel products including commercial pigs for ladle and retort addition to steel, various forms such as plates, cups, saucepans, cafeteria trays, extruded rods and tubes, sheets, etc. were on display. A beautiful nickel medal commemorating the 25th anniversary of the Mond Nickel Co., was shown, on the obverse side of which Satan was depicted as catching nickel pellets from the air typifying the Mond process of nickel refining by precipitating nickel in pellets from a gas, nickel carbonyl. The reverse side showed the

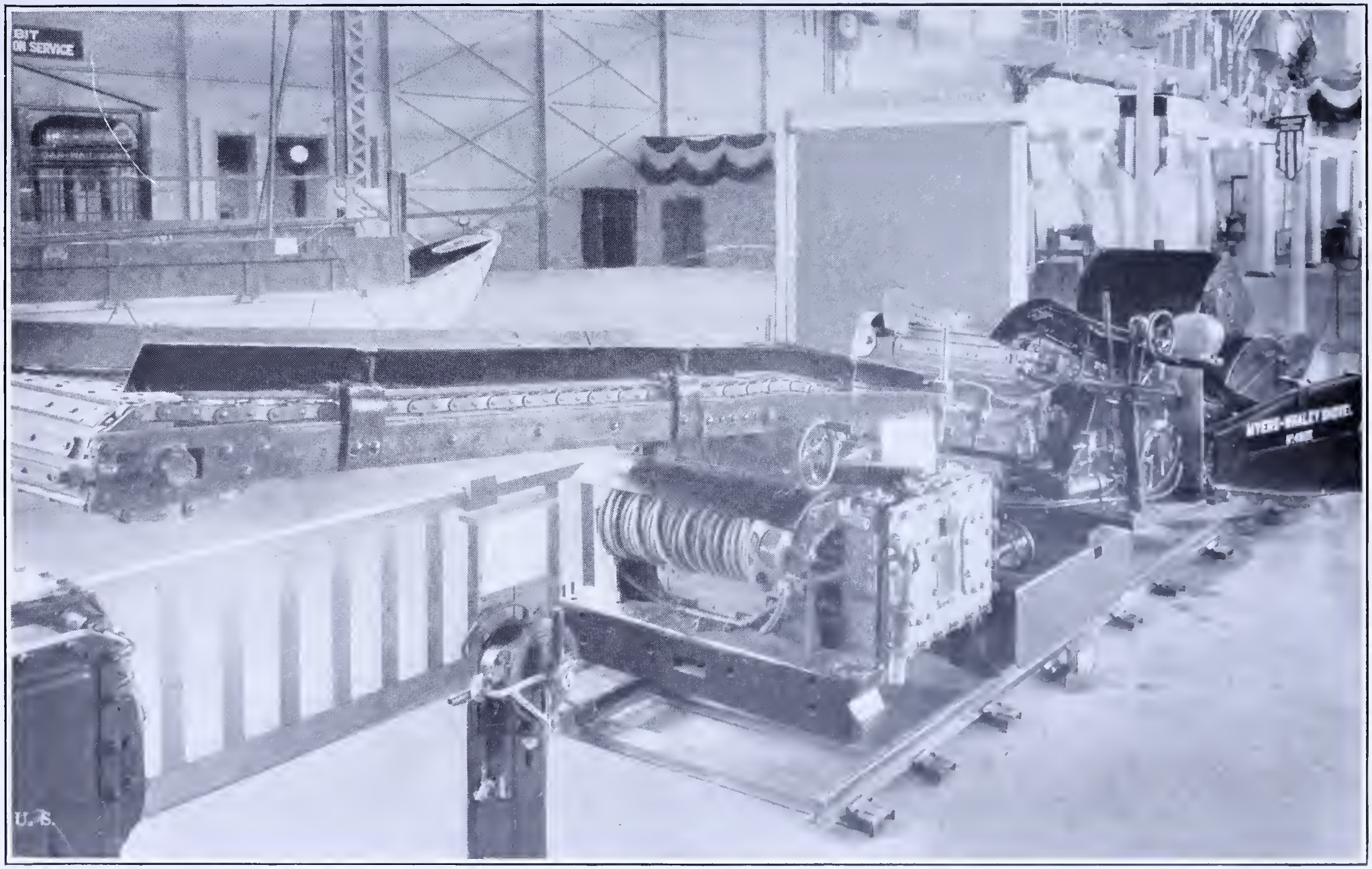

PLATE 228.—Electrically driven combined coal shovel and coal car loader.

maple leaf of Canada where the ore is mined and the daffodil of Wales where the nickel is refined.

ALUMINUM—The aluminum display included various sizes of electrical transmission cable with steel core; aluminum collapsible tubes; a roll of aluminum foil containing 31,500 square inches of aluminum to the pound, and extruded rods in various shapes. A strut of duraluminum from the rigid dirigible Shenandoah, a board holding various articles made from the same alloy, and several aluminum die and sand castings were also on display.

MAGNESIUM—The magnesium display included magnesite from California and Washington, redistilled magnesium, various magnesium-copper alloy castings; magnesium ribbon, rod, tube, bar and wire.

Sapphires. This display included sapphires in the matrix and several trays of blue sapphires used in the watch jewel industry. Seventy-two cut sapphires were so arranged as to spell the word "Sapphire." This exhibit was valued at $2,500. The sapphires were mined in the vicinity of Utica, Montana.

Arc lamp. The four large cases containing the mineral exhibit were backed against a high partition containing a chart which enumerated the activities of the Bureau of Mines. The entire background was illuminated by a large Cooper-Hewitt mercury arc lamp in such a manner as to attract attention.

Non-Metallic Minerals. This exhibit included such products as asbestos, marble, limestone, slate, graphite, kaolin, china clay, various types of refractory brick, talc and soapstone, mica, sands, etc.

Mineral Salts. This exhibit showed in inverted bottles some 200 samples of the salts and chemicals of the more common minerals and metals.

Ancient Mineral. A piece of uraninite (uranium oxide) from the Black Hills of South Dakota, which analysis showed was 1,700,000,000 years old, was loaned for exhibiton by Dennis Henault, Keystone, South Dakota.

MINE SAFETY

In illustrating safety in mining, the Bureau presented various recent types of mining machinery (actual size), all having been approved by the United States Bureau of Mines as permissible or flame-proof. Included were:

Myers-Whaley Shovel and Conveyor.—This is the first approved electrically driven machine built featuring the complete enclosing of all electrical parts making it possible to operate in a gaseous atmosphere without danger of an explosion. (Plate 228).

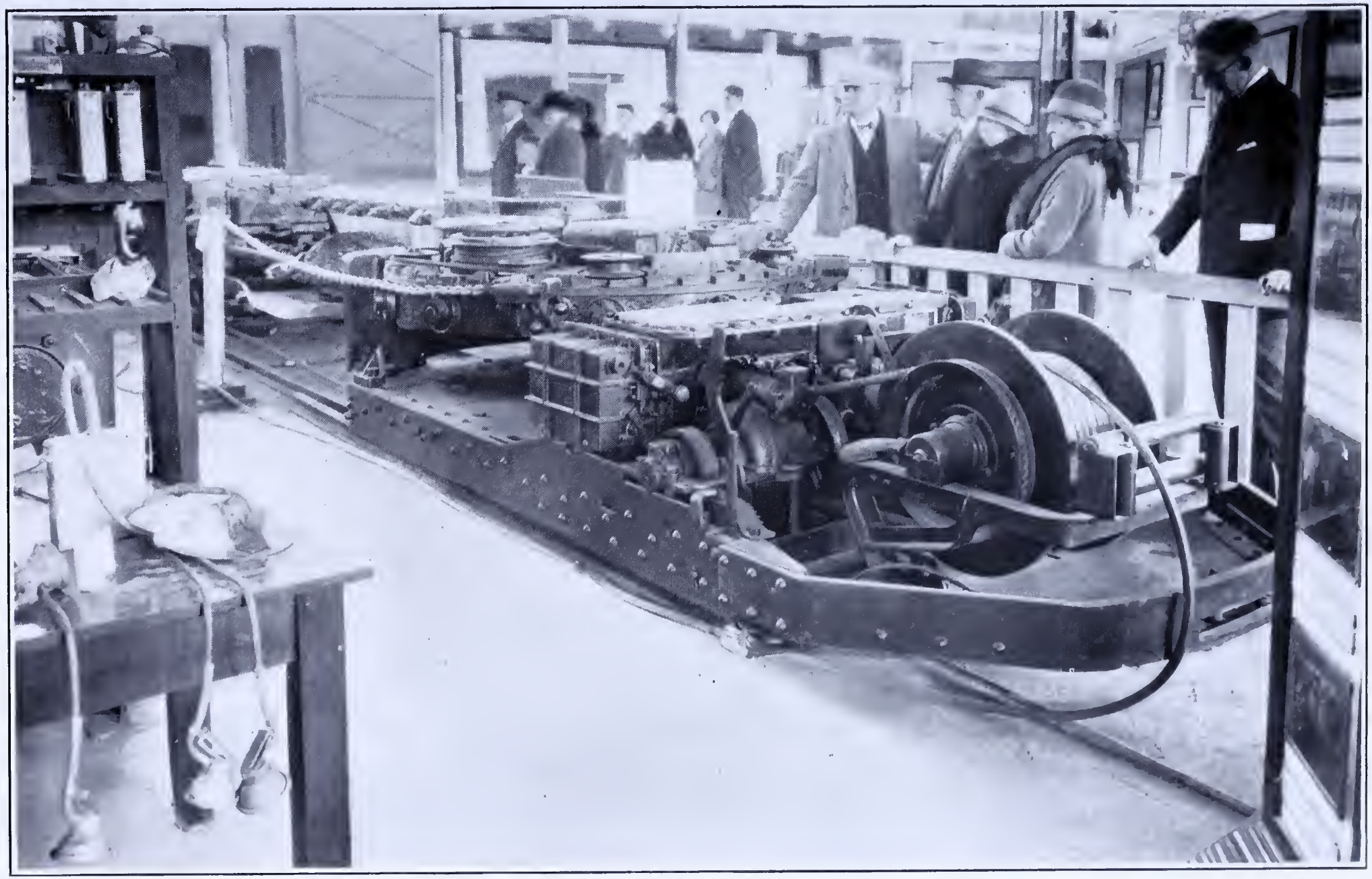

PLATE 229.—Coal-cutting machinery and miners' safety lamps.

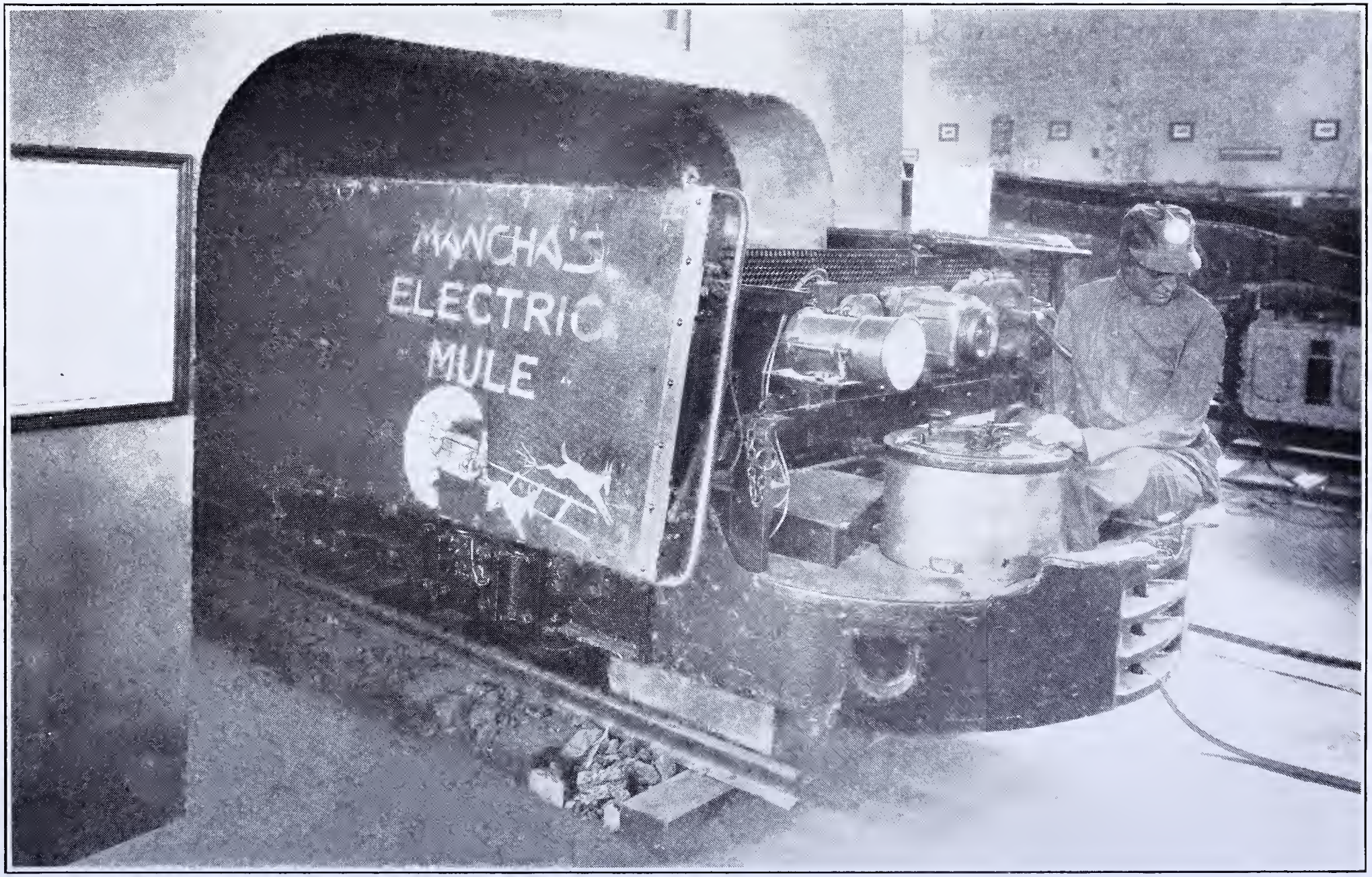

PLATE 230.—Electric mine locomotive entering pit mouth.

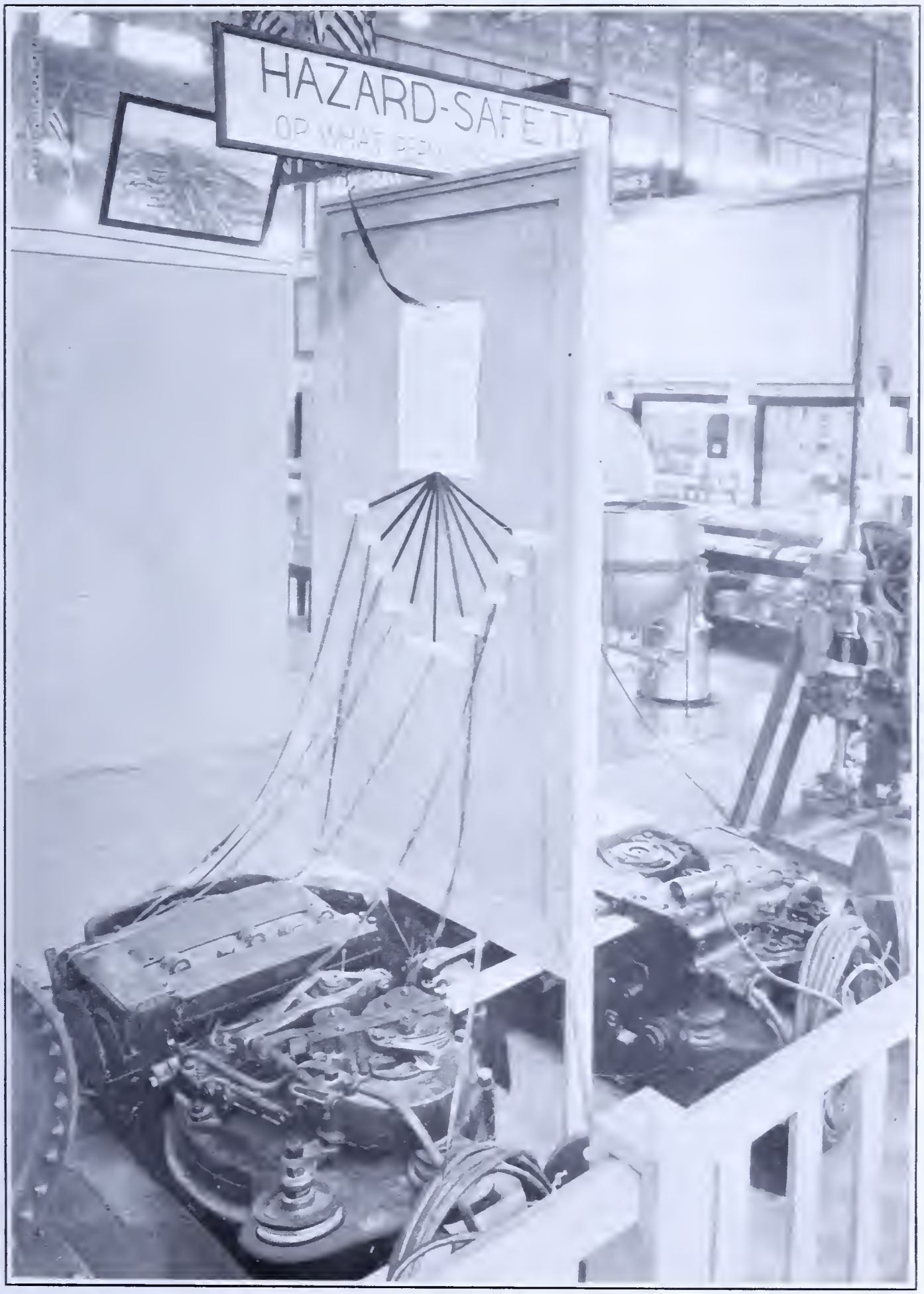

PLATE 231.—Demonstration of dangerous features in older types of mining machinery.

Jeffery and Goodman Coal Cutting Machines.—These machines are self-propelling and have been approved by the Bureau of Mines as safe flame-proof equipment. (Plate 229).

Sullivan and General Electric Air Compressors.—These are portable machines embodying all safety features required by the Bureau of Mines for safe operation in gaseous atmosphere.

Mancha Storage Battery Locomotive and Power Tank.—This approved type of locomotive is used extensively in coal mines replacing the Trolly type and thereby reducing explosive hazards in gaseous atmosphere. (Plate 230).

Safety and Hazard.—Two Sullivan coal cutting machines (an old type and a late approved type) showing the salient features between permissible and non-permissible mining equipment. (Plate 231).

Electric Storage Batteries and Charging Equipment.—Among the types of Mine Locomotive Batteries on display were Philco, Gould, Edison and Exide. Included in the charging equipment was the Chandeyson Generator Set which is used to charge the Philco batteries contained in the power tank of the Mancha electric storage battery locomotive.

Three Permissible Types of Electric Cap Lamps.—The Edison, the Concordia and the Khoeler Wheat lamp. These lamps are so constructed that in case of accidental breakage, there is no possible chance of their causing an explosion through filament contacts or glow in a gaseous atmosphere.

Charging Racks.—Used to recharge the small batteries which are an integral part of the electric cap lamps.

Flame Safety Lamps on Display were the Wolf and the Khoeler.—Used to detect the presence of methane and carbon dioxide in mine atmosphere. A change in appearance of the lamp flame is produced where these gasses are present in the mine.

Types of Approved Equipment Used in Mine Rescue and Recovery Operations.—This exhibit included three approved types of self-contained oxygen breathing apparatus, namely the Gibbs, Paul and McCaa.

Fatal Accidents in Coal Mines.—A table showed graphically in transparencies and legends, the causes of accidents, and lighted columns represented the percentage of each type of fatal accidents to the total accidents over a period of ten years.

Electrical Explosion Gallery.—Developed and used by the Bureau of Mines to demonstrate the explosive hazards of an electric spark from defective wiring, open motors, or uncovered switches in the presence of gas.

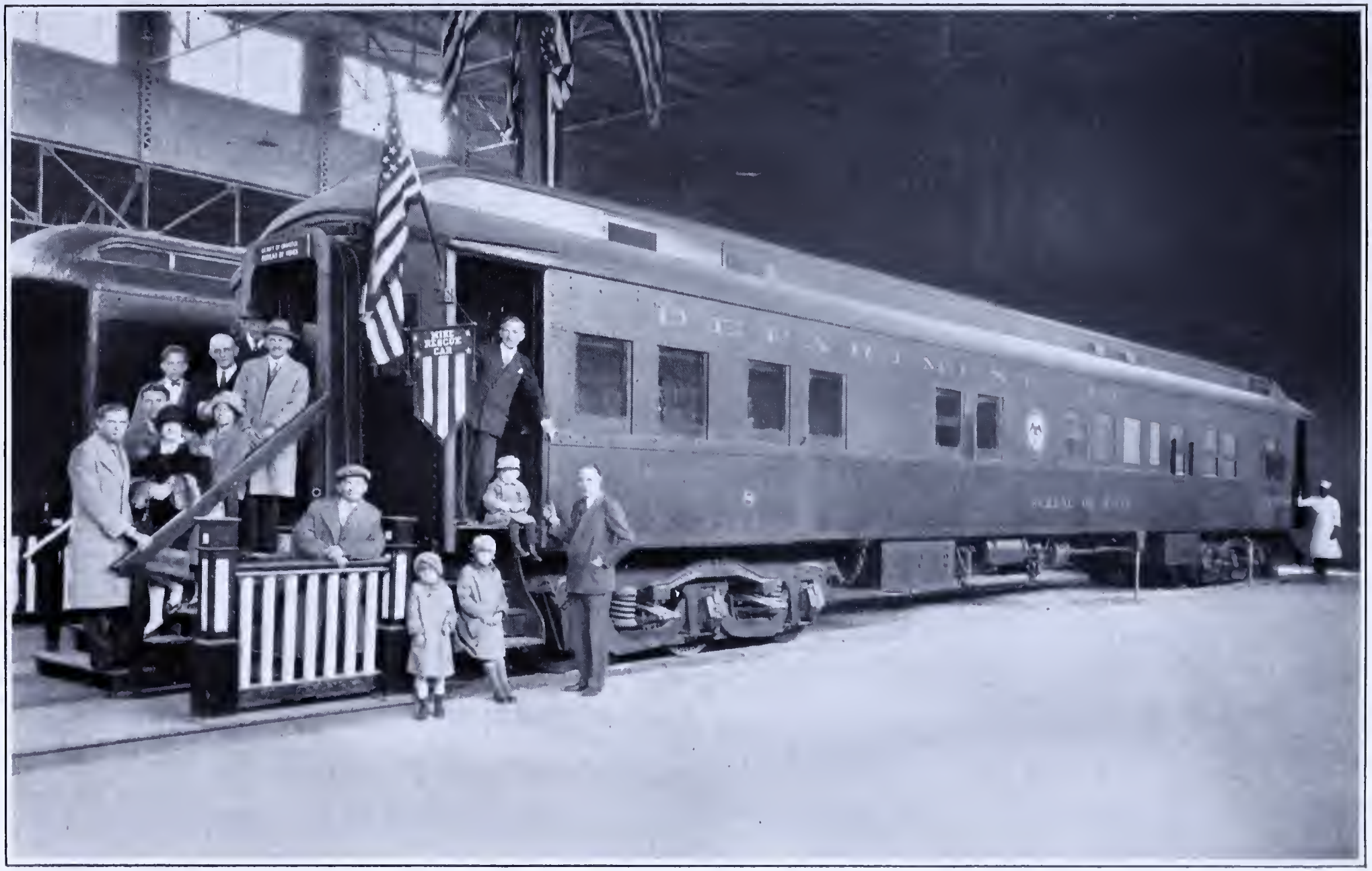

PLATE 232.—Instruction and emergency rescue car of Bureau of Mines.

Carbon Monoxide Recorder-apparatus Developed by Bureau of Mines.—Used in the detection and recording of the carbon monoxide content in the traffic tubes and tunnels.

Explosives Table.—A display of permissible explosives and shot-firing devices.

Mine Rescue Car No. 8.—The latest type rescue car used by the United States Bureau of Mines for emergency and instruction purposes. (Plate 232). This car is of a special design, functions as a complete and independent unit, and contains the following compartments:

DEMONSTRATION ROOM

This compartment contains the apparatus necessary for mine rescue operations and instruction work, such as:

The Gibbs, Paul and McCaa two-hour type of oxygen breathing apparatus which supplies oxygen necessary for life and repurifies the exhaled air. It weighs about 36 pounds and the wearer can work hard and steadily in irrespirable air for at least two hours.

Oxygen storage cylinders and compressor pump used in filling the above mentioned self-contained oxygen breathing apparatus.

Complete first-aid equipment containing Stokes navy stretcher, splints, first-aid dressing and bandages.

Complete Delco lighting system and electric cap lamps and charging rack.

A large ventilated, zinc-lined, apparatus locker constructed on a humidifier design, containing seventeen sets of breathing apparatus.

LIVING QUARTERS FOR CAR CREW

This compartment contains a standard Pullman section with berths for four persons, clothes and linen lockers.

Car office containing typewriter desk, car files and berths for two persons.

Completely equipped lavatory containing a bath tub and shower.

Chef's quarters containing lavatory and shower and berth for two persons.

Dining room containing china and silver cabinets, table capacity for eight persons, and sleeping accommodations for two persons.

Kitchen containing Majestic coal range with hot water attachment connected with two 50-gallon hot water storage tanks, 2-ton capacity coal bunkers, large 700 pound ice capacity refrigerator.

This car is heated by two hot water heaters, one located in the kitchen and the other on the passageway between demonstration room and crew quarters.

PLATE 233.—Front view of radio apparatus, gauges and maps –Bureau of Navigation.

Four large storage lockers and a 500-gallon cold water storage tank are carried between the trucks under the car.

Bureau of Navigation

The exhibit of the Bureau of Navigation was limited to the Radio Service. (Plate 233). The latter occupied 752 square feet in the southwestern corner of the Departmental area. The object was to show the advancement in the equipment and methods for utilizing radio in the safeguarding life and property at sea and the regulation of wireless communication on land. A low semi-circular counter gave an easy view of the bulkier exhibits. Inspectors' gauges, meters and instruments, along with crystals and other valuable and attractive articles were on view in a large glass case.

Maps suspended above the exhibits showed commercial and private broadcasting stations; government stations; and number of amateur stations in each district.

The following are some of the various features of the exhibit of the Bureau of Navigation, with explanatory data:

Broadcast Transmitter.—One modern continuous wave and broadcast transmitter, 1,000 watts on the former and 500 watts on the latter ready to function at any time.

Ship Transmitter.—One 2 kilowatt spark transmitter commonly used in ship and shore stations.

Ship Transmitter.—One 200 watt continuous wave transmitter suitable for ship or shore stations.

Arc Transmitter.—One 2 kilowatt arc transmitter used extensively, and capable of working exceptional distances.

Spark Transmitter.—One 500 watt transmitter, employing a quenched spark gap, commonly used on shipboard for the past twelve years.

Amateur Transmitter.—One 100 watt continuous wave transmitter used in amateur communication which will function on wave lengths from 34 to 112 meters.

Spark Coil.—One spark coil commonly known as 10″ coil, used as the first transmitter from land to ship and ship to land and is extensively used on foreign ships at the present time for emergency equipment.

Crystal Receiver.—One non-regenerative Marconi receiver using crystal detector.

Combination Receiver.—One receiver combining the use of both crystal and vacuum tube as detectors.

Short and Long Wave Receiver.—One regular Navy standard regenerative receiver fitted with a self containing vacuum tube detector for both short and long wave reception.

Navy Type Receiver.—One type of Navy receiver used extensively during the War but now obsolete.

Variable Range Receiver.—One all-wave receiver with range of 50 to 50,000 meters.

Variable Range Receiver.—One receiver with range of 35 to 800 meters on a single coil. This type of receiver is valuable in checking amateur, broadcast, and ship transmitters, and obviates the necessity of using a different receiver for each class of station.

Old Type Receiver.—Type of coherer, crystal detector, and Marconi magnetic detector used before the discovery of the vacuum tube.

Storage Battery.—One bank of 100 nickel steel—iron oxide cells with 250 ampere hour capacity used on shipboard to furnish power for radio communication in the event that the ship's dynamo fails.

Radio Compass.—An instrument used to obtain a ship's bearing and position and one of the greatest single inventions for the aid and protection of navigation since the advent of the magnetic compass.

Underground Loop.—Used extensively by the Army and Navy during the War in the detection of the enemy transmition and now used in directional work.

Storage Battery.—One bank of lead plate—sulphuric acid cells with a total voltage of 2,304 volts used as plate supply for vacuum tube transmitters and receivers.

Storage Battery.—6 volts storage cells used to light the filament of vacuum tubes.

Various Types of Apparatus.—One of the principal features of the exhibit was a large glass case containing all the smaller instruments used in the radio service and small pieces of pre-historic apparatus.

Decremeter.—Used to ascertain whether or not a transmitter complies with the radio laws in matter of decrement.

Piezo Oscillator.—Piezo oscillator, a new and valuable device used in calibrating wave meters and in the maintaining of certain frequency by transmitting stations.

Wavemeters.—Used in checking all types of transmitters on any wave length.

Meters.—Various meters for checking and measuring the voltage current and power consumption of transmitters.

Vacuum Tubes.—Receiving and transmitting vacuum tubes from 2 watts to 250 watts, rated power.

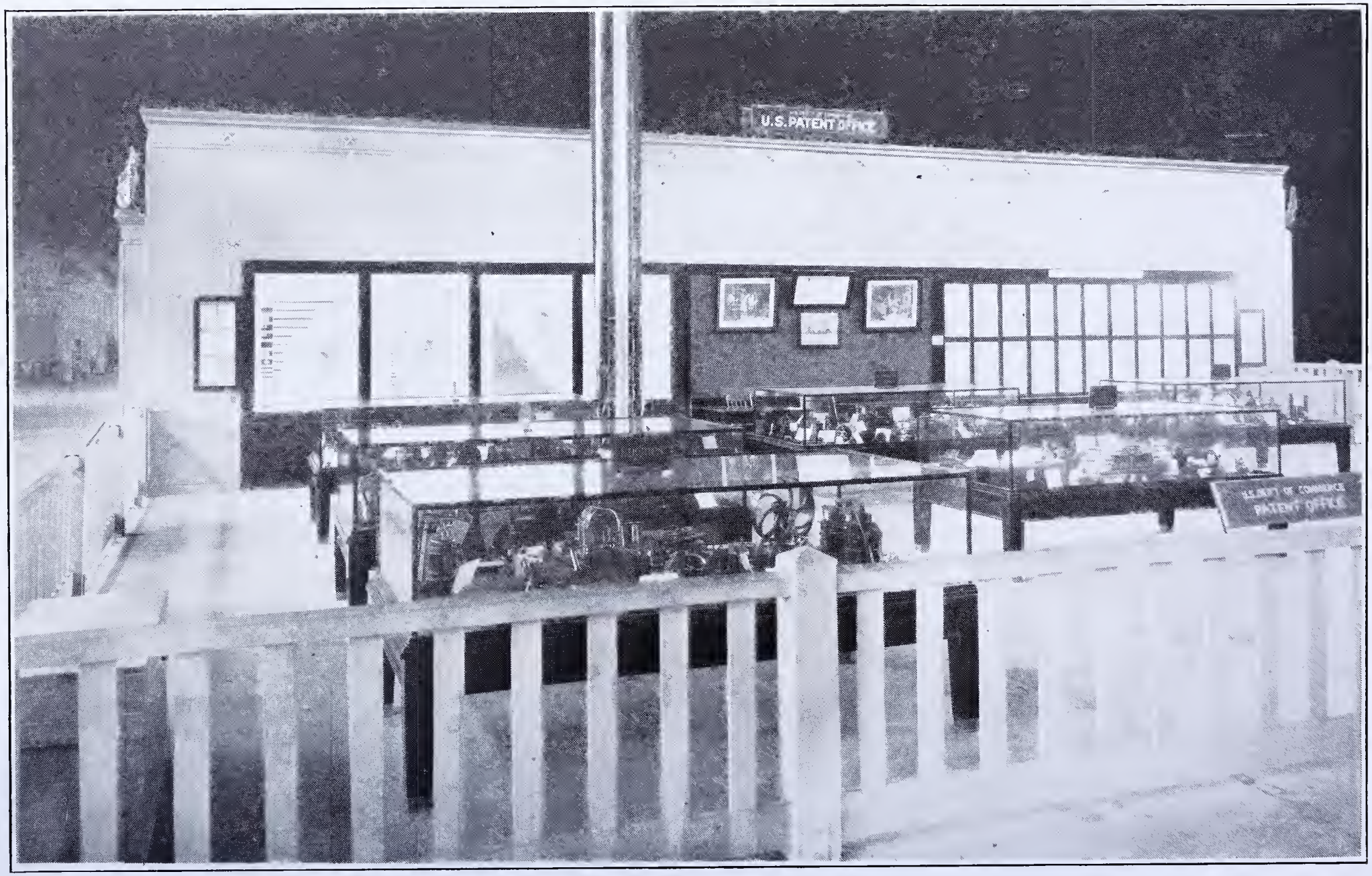

PLATE 234.—Patent Office exhibit.

Direction Finder.—Portable direction finder used in locating sources of interference to radio reception and in locating illegal radio transmitters.

Omnigraph.—An automatic transmitter for Morse code used in the examination of applicants as to their ability to meet the requirements of the radio laws in receiving.

Charging Panels.—For charging emergency apparatus used for operating transmitters when the main source of power fails and for charging "A" batteries on receivers thus assuring continuous power supply.

Motor Generators.—Motor generators operating transmitters from 110 to 2,000 volts.

Maps and Illustrations.—Showing commercial and private distribution of broadcast stations in the United States; Government owned and operated stations in the United States and its possessions; and the number of amateur stations in each district.

Operator Licenses.—A display of operator licenses required for the operation of each class of radio station.

Patent Office

The displays of the Patent Office occupied a central section 50 feet long and 32 feet wide. (Plate 234). The chief exhibits were old models, many of historical interest, that were shown under glass on six special tables. The story of the present work of the Patent Office was given in charts and pictures hung on the partition. One of the strongest reminders of the public service rendered by this agency of Government was in the unpretentious exhibit captioned, "Patents that have influenced the world's progress." Here against the partition were shown enlarged replicas of the drawings printed in the original patent for Whitney's cotton gin, Howe's sewing machine, Bell's telephone, Edison's incandescent electric lamp, Mergenthaler's linotype and many others equally deserving of place under that significant title.

Since the Patent Office has not required models (save exceptionally) for nearly 50 years, those recent inventions were not available. Models acquired prior to 1888, however, were selected for their historical or typical significance and put on view in five groups: Engines (power developers), Agricultural machines and devices, Textile producers and adapters, Military and maritime inventions, and miscellaneous devices and oddities. Models by Edison, Eads, Ericsson and Gatling appeared in the collection. The oldest model was by Faries, October 10, 1829, a 10 shot repeating cannon.

Enlarged lithographs of a Massachusetts colonial patent issued in 1746 and a Federal patent signed by "George Washington" added historical interest.

The full list of exhibits follows:

CHARTS

Patents granted to all countries.
Patents issued in the world by countries.
U. S. Patents by years—1790 to 1926.
Distribution by states of patentees 1925.

ENLARGED LITHOGRAPHS OF PATENTS

Patents issued by Colony of Massachusetts, 1746.
Patents signed by George Washington.
"Patents that have influenced the world's progress":

E. Whitney, March 14, 1794, COTTON GIN
C. H. McCormick, June 21, 1834, REAPER
1,647, S. F. B. Morse, January 20, 1840, TELEGRAPH
4,750, E. Howe, Jr., September 10, 1845, SEWING MACHINE
1,085, C. Goodyear, November 20, 1860, VULCANIZING RUBBER
88,929, G. Westinghouse, Jr., April 13, 1868, STEAM POWER BRAKE
79,265, Sholes, Glidden & Soule, June 23, 1868, TYPEWRITING MACHINE
105,338, Hyatt & Hyatt, July 12, 1870, improvement in treating and molding Pyroxyline (celluloid)
138,405, E. H. Janney, April 29, 1873, CAR COUPLING
157,124, J. F. Glidden, November 24, 1874, WIRE FENCES
174,465, A. G. Bell, March 7, 1876, TELEPHONE
200,521, T. A. Edison, February 19, 1878, PHONOGRAPH OR SPEAKING MACHINE
223,898, T. A. Edison, January 27, 1880, ELECTRIC LAMP
347,140, E. Thomson, August 10, 1886, ELECTRIC WELDING
382,280, N. Tesla, May, 1888, ELECTRICAL TRANSMISSION OF POWER
400,665, C. M. Hall, April 2, 1889, manufacture of ALUMINUM
419,065, W. B. Purvis, January 7, 1890, FOUNTAIN PEN
436,532, O. Mergenthaler, September 16, 1890, LINOTYPE
495,341, F. E. Ives, April 11, 1893, PHOTOGRAVURE PRINTING PLATE
560,291, E. G. Acheson, May 19, 1896, ELECTRIC FURNACE
766,768, M. J. Owens, August 2, 1904, GLASS SHAPING MACHINE
821,393, G. & W. Wright, May 22, 1906, FLYING MACHINE
879,532, L. DeForest, February 18, 1908, SPACE TELEGRAPHY (radio)

PLATE 235.—Polariscope and other exhibits of Bureau of Standards.

PATENT OFFICE PUBLICATIONS

Samples of the publications issued by the Patent Office.

MODELS

Models filed in connection with applications prior to 1880, showing interesting and historically important devices and machines. There were 109 models in this collection.

BUREAU OF STANDARDS

The Bureau of Standards occupied an area 65 feet long and 54 feet wide at the southeast corner of the Department's space. (Plate 235). The Bureau's activities in applied physics and chemistry were set forth by a great number of models and full size working devices, many electrically operated at the will of the visitor. These were installed on a double row of tables forming a hollow rectangle. The classification of the collections followed the distribution of work as organized within the Bureau at Washington and were:

Electricity
Weights and Measures
Heat and Power
Optics
Chemistry
Mechanics and Sound
Organic and Fibrous Materials
Metallurgy
Clay and Silicate Products
Building and Housing

Publications of the Bureau of Standards.—Sample of each series of publications issued by Bureau of Standards: Scientific papers; technologic papers; circulars; miscellaneous; handbooks; elimination of waste—simplified practice recommendations, limitation of variety recommendations, building and housing, technical news bulletins; announcement cards of new publications.

Organization Chart.—Chart showing organization of the Bureau.

Wire Resistance Standards.—Four wire resistance standards of the sealed type such as are used in maintaining the unit of electrical resistance.

*Absolute Measurement of Electrical Resistance.** The unit of electrical resistance (the ohm) is determined from the mechanical units of length and time. In this apparatus the electromotive force generated by the disks rotating in the magnetic field of the coils is balanced against the drop in potential through a resistance in series with the coils.

*Electric Current Balance.** Illustrated the method used in measuring electric current in terms of mass, length, and time. From the radii of the coils and their distance apart, the force which will be produced

by the magnetic action of a given current in the coils can be computed. This force is balanced by a known weight on the opposite end of the beam.

*Deflection Potentiometer.** This instrument, developed by the Bureau of Standards, is used by it in testing electric instruments and electric lamps, by electrical instrument makers, and by the meter departments of electric power companies. It was connected to measure voltage on the direct-current circuit.

*Direct-Current Voltmeter.** Instruments of this type are tested by the Bureau of Standards and used as standards in testing direct-current watt hour meters, etc. It was connected to measure the voltage of the direct-current circuit.

*Direct-Current Ammeter.** Instruments of this type are tested by the Bureau of Standards and used as standards in testing direct-current watt hour meters, etc. It was connected to measure the current flowing through the direct-current lamps. When a lamp was turned on or off, the reading of the instrument changed.

Electrodynamic Watt-meter. Instruments of this type can be tested on direct-current with a potentiometer and used on alternating current to measure electrical power.

*Alternating-Current Voltmeter.** Instruments of this type are tested by the Bureau of Standards, and used by the industry in checking other voltmeters. It was connected to measure the voltage on the alternating current circuit.

*Direct-Current Watt-hour Meter.** Meters of substantially this type are used for the final metering of electrical energy at residences or factories.

*Alternating-Current Ammeter.** Instruments of this type are tested by the Bureau of Standards, and used by the electrical industry in checking other ammeters. It was connected to measure the current flowing in the alternating-current lamps.

*Alternating-Current Watt-hour Meter.** This meter was connected to measure the energy supplied to a bank of lamps.

Current Transformer Testing Set. This instrument is based on a method devised at the Bureau of Standards for testing current transformers.

*Headlight.** Six headlights were exhibited, showing proper and various improper illuminations and the causes therefor.

Piezo Oscillator Radio Standard. The piezo oscillator used by the Bureau of Standards as a radio frequency standard, which uses a quartz plate cut from a natural quartz crystal.

Standard Frequency Meter.—Continuously variable standard of radio frequency, as used at the Bureau of Standards.

Soil-Corrosion Investigation.—Specimens showing corrosion of buried soil pipe at end of first test period.

Silver Voltameter. The silver voltameter, the primary standard for measuring the international ampere. Two forms of the instrument were shown.

Standard Cells. The Weston Normal Cell is the standard for the international volt.

Standard Cells. The unsaturated form of standard cell is suitable for laboratory use.

Storage Battery Research. The effect of impurities on storage batteries as shown by exhibited plates.

Mercury Ohm. The "mercury ohm" of which a model was exhibited, represents the physical realization by the Bureau of Standards of the "international ohm," the unit of electrical resistance defined by international agreement as "the resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice, 14.4521 grams in mass, of a constant cross-sectional area and of a length of 106.300 centimeters."

*Blood-Counting Chambers.** Blood-counting or haemacytometer chambers are used by physicians for counting the red and the white corpuscles of the blood in the diagnosis of disease. A sample of diluted blood is placed in the chamber and the corpuscles on the ruled squares are counted. Since accuracy of diagnosis demands accurate counting chambers, the Bureau of Standards is called upon to test large numbers of these chambers. The microscope and depth measuring device used for this purpose were also exhibited.

Length Comparator. An instrument designed and built at the Bureau of Standards for testing end standards of length, which are used in industry, by comparing them with a precision line standard. This instrument is suitable for testing bars up to 20 inches. Determinations may be made on this comparator to an accuracy of five millionths of an inch.

Standards of Length and Mass. Replicas of the National Prototype Standards of length and mass, and examples of the several classes of sub-ordinate weights tested by the Bureau of Standards.

*Time Signals by Light Ray.** There is no mechanical connection between the pendulum and the other apparatus, yet the swinging pendulum causes the signals which are heard and which may be recorded on the chronograph. As the pendulum interrupts the beam of light, the resistance of the photo-electric cell is increased and a current, amplified by the radio tubes, passes through the relay drawing over the armature; when the light again falls upon the cell the armature is released. Extra signals were made by passing the hand through the beam of

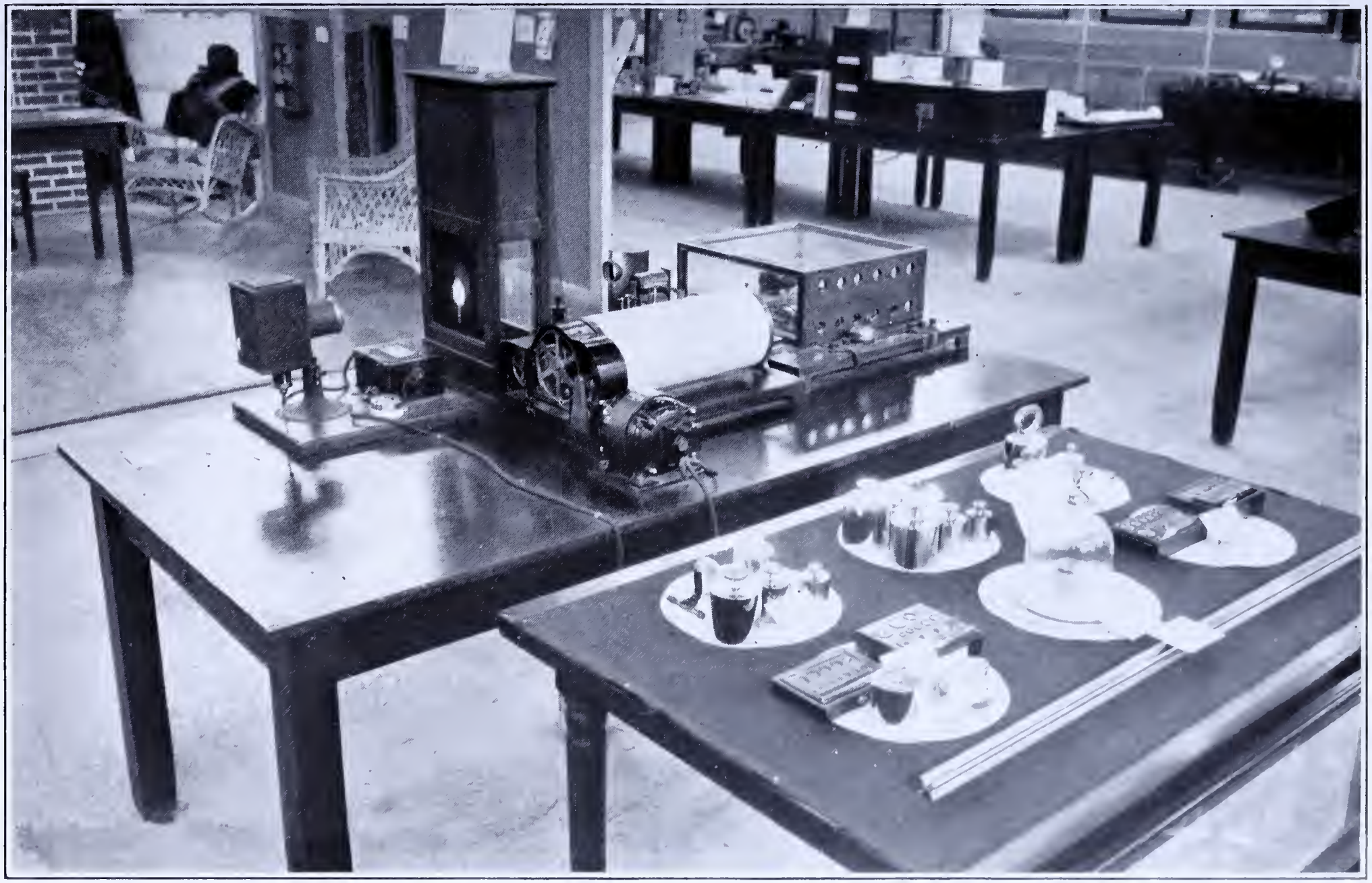

PLATE 236.—Photo-electric time-signal-transmitting apparatus and exhibit of standard weights.

light. This interruption of the light ray causes the cell, relay, and sounder to function in the same manner as when the ray is interrupted by the pendulum rod. (Plate 236).

Volume Determinations by Weighing. Pipettes for blood counts.

Volume Determinations by Weighing. Testing measures for gasoline pumps and scales for weighing them.

*Dental Amalgam Interferometer.** The amalgam is tested for expansion or shrinkage by being made one of the three supports for the top plate of the interferometer. The interference fringe pattern may be observed when the switch is closed. Any change in length of the amalgam support produces a characteristic change in the pattern.

*Dental Amalgam Flow Micrometer.** This instrument applies a constant force to the amalgam specimen (at the foot of the vertical plunger) and enables the investigator to determine the flow, and thus to select alloys in which the flow is not excessive.

*Light Waves as Standards of Length.** Standardization of an indicator gauge using light waves as the standard of length.

Standards Furnished to the State. Much of this equipment is still used by the States, although in numerous cases the standards have been lost through fire or other causes, or have been supplanted by more modern standards certified by the Bureau of Standards. These are the meter, yard, half-bushel, litre, decalitre, and a set of standards of liquid measure.

Typical Equipments for Field Inspectors. These are used by the Inspector of Weights and Measures in testing the scales, weights and measures used in commerce and industry. For testing heavy-capacity scales, forty or more 50-pound cast-iron test weights are used.

Testing Railroad Track Scales. The scale model illustrated a two-section "master" scale such as is used in standardizing railroad-scale-testing units.

Precision Gauge Blocks. These blocks are used as reference "end standards" in the manufacture and inspection of machine parts and limit gauges. They are accurate in length to 1 part in 100,000, and in flatness and parallelism of surfaces to 0.000005 inch. By a proper combination of sizes any desired length within the range of the set, can be obtained to the nearest 0.0001 inch.

Standard Scale of Temperature. A chart showing the standard temperature scale from—190° centigrade to 4,000° centigrade.

Primary Standard for Measuring Pressure. The 220-pound revolving weight, together with its supporting steel piston, is balanced and supported by oil at a pressure of 1,440 pounds per square inch. High pressure may be measured very accurately with this apparatus.

Thermal Units. Samples of oxidizable standards which, on burning, liberate a definite known quantity of heat.

*Comparison of Heat Insulation.** A dozen samples of building materials maintained at steam temperature on one side. Visitors touched the opposite side of the samples to determine relative value as insulators.

Comparison of Materials as Insulators. Samples of insulating materials of equivalent thicknesses, attached to a brick wall.

*Fire and Fire Tests.** Some of the activities of the Bureau of Standards for determining the fire resistive value of building materials and constructions, as illustrated by ballopticon.

Time-Temperature Curve for Fire Tests. An illuminated chart.

Insulated Safe After First Test. This safe preserved its contents in a two hour fire test.

Altitude Laboratory. Model showing how engines can be tested in this laboratory under atmospheric conditions that prevail at high altitudes.

"Ceiling" Power of Airplane Engines. Chart showing the power developed by the large engine at the altitude shown is equal to the power developed by the small engine at sea level.

Weight of Air vs. Engine Power. Chart showing the relation between them.

*Equipment for Testing Brake Linings.** This apparatus was developed by the Bureau of Standards and is used in testing all brake linings used by the United States Government.

Journal Bearing Friction Machine. Model of the machine used at the Bureau of Standards in a study of the effect of dilution and grit on the performance of motor lubricating oils.

Crank Case Dilution Still. Exhibit of the apparatus.

*Effect of Temperature on Oil.** Apparatus for showing that temperature affects the viscosity of oil.

Gasoline Sulfur Lamp. This lamp is used for the determination of the per cent of sulfur in gasolines.

Viscomparator for Lubricants. The viscomparator is used to determine rapidly and accurately the viscosity of lubricants.

Decelerometer. This instrument is used to determine the stopping distance of an automobile upon application of the brakes.

Gaseous Explosions. Model illustrating apparatus and methods in use at the U. S. Bureau of Standards in investigations of the thermodynamics and kinetics of explosive gaseous reactions.

*Fuels for High-Compression Engines.** Model illustrating how the compression of an engine is increased by reducing the clearance volume.

Spectrochemical Analyses. Charts showing that the emission spectra which characterize the chemical elements may be used to make chemical analyses of compounds, alloys, minerals, etc.

Spectral Structures. Chart showing that from the distribution and relative intensities of spectral lines, and from their behavior under special conditions, we deduce information as to the structure of the atom and its energy changes in the process emitting light.

*Spectra of Gases** Tubes containing hydrogen, helium and neon bases which become luminous when an electric discharge passes through them. This light when dispersed reveals the characteristic spectrum of the chemical element. Each colored image is produced by a certain wave length of light which has been determined with high precision to serve as a standard reference point in spectra or for the measurement of other lengths.

Ripening of Photographic Emulsions. Chart showing experimental emulsions made in the investigation of photographic sensitivity.

Photographic Reversal. Transparency showing that light under proper conditions can destroy the latent image on a photographic plate.

Levulose Manufacture. Products showing steps in the process of manufacture of levulose from artichokes. From 80 to 85 per cent of the sugar can be recovered in crystalline form. Levulose is considerably sweeter than cane sugar.

Saccharimeter with Adjustable Sensibility. Bureau of Standards Type, According to Bates. An instrument used for the analyses of sugars. By means of this optical instrument the per cent of pure sugar present in a sample may be determined with high accuracy.

*Imported Sugars.** Samples.

Microphotographs of Sugar Crystals. Sucrose from cane or beet; dextrose from corn; levulose from artichokes.

Sugars of Different Chemical and Color Qualities. The purpose of refining process of raw sugars is the accumulation of the chemical impurities and coloring matters in the residual molasses, while the refined sugar is produced by a process which reduces the possible technical losses of sucrose to a minimum.

Simple Reflection Polariscope. Used for demonstrating polarization by reflection and for studying those effects produced when polarized light traverses certain crystals and liquids or strained bodies such as unannealed glass.

Models Showing Lens Aberrations. Showing the focus of an ideal lens, and of lenses having longitudinal chromatic aberration, lateral chromatic aberration, spherical aberration, coma, and astigmatism.

*Rifle Barrel Camera.** To determine the best material to be used in a rifle barrel, it is necessary to study the progress of wear (inside

the bore) resulting from use. Before the development of this camera it was customary to split the barrel lengthwise for this purpose. This camera, developed and built at the Bureau of Standards, makes a photograph of the bore on a motion picture film. It is now modified to permit one to see the interior of the bore.

Optical Components at Bureau of Standards. The research work of the Bureau of Standards continually calls for optical components which must be specially designed and manufactured for particular purposes. Such parts are constructed as needed in the Bureau's optical shop, and samples of this work are here shown. Not all parts are used for optical purposes. The quartz plates are used to measure the pressure in a cannon at the moment of firing and to control the frequency of a radio broadcasting station.

A Crystal of Quartz. Crystal of Quartz as found in Brazil.

A Quartz Flat. Standard flat used for testing the flatness of surfaces. At no point does it deviate from perfect flatness by more than one-fifth of a wave length of light; that, four hundred-thousandths of an inch.

Direct Vision Prisms. This prism is used to view the spectra of gases.

A Quartz Oscillator. If elastic vibrations are set up in this plate, the periodic changes of pressure cause electric charges to appear periodically on the surface of the plate. In connection with radio amplifying tubes, this provides a standard of wave length, or frequency, by which the wave length of a radio broadcasting station may be controlled. The frequency obtained depends upon the dimensions of the quartz plate.

*Sensitiveness of Interference Measurements.** This instrument shows that even a small force can bend an apparently rigid body. It also shows that by using the interference of light very small movements can be accurately measured. On looking through the eye-piece concentric light and dark rings or interference fringes can be seen. Pressure on the center of the rail causes the rings to contract and disappear into the center. The disappearance of each ring shows that the rail has bent an additional 1/100,000 of an inch.

*Test of Optical Surfaces.** Light and dark bands produced by the interference of light reflected from the two contiguous surfaces of the plates. The straight bands showed that the surfaces were plane within one-millionth of an inch. The crooked fringes showed that the surfaces were not plane. The circular bands showed that the surfaces were convex or concave.

Hiding Power of Paint. Chart.

Fastness to Light of Textiles. The fastness to light of dyed textiles depends not only upon the kind and intensity of the light, but also upon other conditions, of which humidity is perhaps the most important. The samples showed types of fading under different conditions.

Bureau of Standards Standard Samples. These certified samples are used to check methods of chemical analyses and to calibrate pyrometers, colorimeters, saccharimeters, and sieves.

Platinum Metals of Highest Purity. One phase of the Bureau's work on the platinum metals (platinum, iridium, palladium, rhodium, osmium, and ruthenium) is improving the quality of the noble metal thermocouple, an instrument for measuring temperatures up to 1,500°C. (2,700°F.). The samples showed the steps in the preparation of the pure platinum and platinum-rhodium alloy used in the thermocouple.

*Principle of Electroplating.** This apparatus showed the method by which electroplating is conducted.

Applications of Electroplating. This exhibit consisted of samples showing that a large number of metals can be plated upon other metals to improve their appearance, suitability and durability for certain domestic or industrial uses.

Types of Printing Plates. The Bureau has studied the deposition of metals for use on printing plates. This exhibit shows electrotypes with copper, nickel, and cromium surfaces, the latter being especially hard.

*Water-Current Meter.** This water-current meter is used to measure the velocity of streams to determine their rate of discharge. It is calibrated by towing through still water. The current-meter laboratory was shown in the photograph. It contains a concrete tank, approximately 400 feet long, 6 feet wide, and 6 feet deep. The meter is towed by a small electric car running on rails on each side of the tank.

*Household Water Meter.** "Cut-away model" of a water meter of the type commonly used to measure water supplied to houses. The operation of the meter may be seen by pressing at the front of the case. The measuring chamber is shown separately at the right of the meter.

Hand Fire Extinguisher. A model showing construction of standards for the Soda-and-Acid type of extinguishers embodied in Government specifications.

*Dead-Weight Pressure Gauge Tester.** Fluid (oil) pressure is applied to the gauge by means of the floating piston and weights, which at the same time accurately measure the pressure.

High Pressure Gauge.

*High Velocity Anemometer.**

Electrically Driven Tuning Forks. An apparatus for maintaining a tuning fork in continual vibration without make and break contacts.

Earth Inductor Compass. Used in airplanes where the ordinary needle compass is often unreliable.

*Gravitation Apparatus.** Apparatus of the form suggested by Professor Boys, of London, for showing the gravitational attraction between comparatively small masses.

*Test of Altitude Instruments.** Aircraft altitude instruments, such as altimeters, barographs, rate-of-climb meters, and statoscopes, are tested by comparing their readings with those of a mercurial barometer. An apparatus was shown in operation in which a surveying altimeter and a rate-of-climb meter (both developed at the Bureau of Standards), are being compared with a mercurial barometer at different pressures.

*Use of Airship Sextants.** The sextant measures the vertical angle between the position of a star (or the sun) and the horizon for the purpose of determining the position of an airship. The sextant was shown in operation, mounted so as to measure the angular altitude of illuminated points on the wall to illustrate the method of using the instrument.

*Use of Aircraft Turn Indicator.** Turn indicators supplement compasses on aircraft by indicating small deviations from a straight line in the flight of aircraft. The instrument shown in operation, was mounted on a turn table to illustrate how it indicates departure from a straight course.

*Aircraft Instrument Vibration Board.** The indications of instruments are often seriously affected by the vibration of aircraft. To ascertain the effect of such vibration the instruments are tested in the laboratory on the board shown, which artificially simulates the vibrations of aircraft.

Model of Large Wind Tunnel. Model of equipment in which a fan 14 feet in diameter is used to produce wind speeds up to 70 miles per hour for the testing of models of airplanes and airships and for investigating wind pressure on structures. Photographs showed the actual tunnel which is 10 feet in diameter and 91 feet long.

*Fan Thrust Meter.** Developed by the Bureau for testing electric fans. The thrust exerted by the fan is proportional to the quantity and speed of the air delivered by the fan. The thrust is measured by the deflection of the platform.

*Proving Ring.** The Bureau of Standards has developed this proving ring of hardened steel in order to measure the error in the load (3,000 kilograms) applied by Brinell hardness machines. The shortening of the vertical diameter is measured by the micrometer. The reed is set in vibration and when the tip of the micrometer screw just touches the reed, as indicated by a musical note, a reading is taken.

Portable Brick-Tester. To measure the transverse strength of bricks on the job, the Bureau of Standards has designed this Portable Brick-Tester. The load is applied by the hydraulic press and is shown by the gauges.

*Tuckerman Optical Strain Gauge.** This instrument was developed (for the Navy Department) at the Bureau of Standards for studying the effect of strains in riveted joints. It consists of an autocollimated quadruple mirror optical lever acting on a 0.2 inch Martens lozenge. Sensitive to 2/1,000,000 inch.

Specimens from Duralumin Airship Girder. Short test specimen of a duralumin airship girder tested for the Bureau of Aeronautics of the Navy Department. Failed under a load of 7,500 pounds. Duralumin has the strength of structural steel (55,000 to 65,000 pounds per square inch) but weighs only one third as much.

Whittemore Strain Gauge. This instrument is used to measure stresses in steel structures.

*Model of Tire Testing Dynamometer.** Power losses in tires are measured on a machine of this kind and studies made of the effect of different tire designs on the frictional losses in tires.

Materials Used in Rubber Compounds. Specimen materials of known purity used at the Bureau of Standards in experimentally compounding rubber in varying proportions to produce compounds of definite physical properties.

Model of Endurance Tire Testing Machine.—Before shipments of tires are accepted by the Government, representative samples are tested on a machine of this kind.

Resistance to Heat Flow Through Textile Materials. Apparatus designed and built at the Bureau to measure the ability of blankets, clothing, and other textile materials to retain the heat which the body generates.

*Yarn Bending Apparatus.** The durability of a yarn, thread, twine, etc., to withstand bending may be measured on this apparatus, which was designed and built at the Bureau.

Paper-Making Research. Papers produced in Bureau of Standards experimental paper mill in researches for improving processes and developing papers for special uses.

*Curl Sizing Tester for Paper.** Instrument devised to measure the degree of sizing of paper or its resistance to permeation of aqueous liquids.

Tester for Conducting Metal Particles. A minimum number of conducting metal particles is required in paper used for electrical purposes. This apparatus was designed to determine the number of conducting particles in a given area of the sample being tested.

*Air Testing Conditioned Testing Cabinet.** Test equipment designed by Bureau for use in studying the strength of paper.

*Scrub-Test Apparatus for Imitation Leather.** Apparatus used to fold imitation leather in alternate diagonal folds under tension, so as to determine the durability of the coating. Developed by the Bureau as an improvement over the hand-scrub test.

Shark Skin Shoe Uppers. To aid in the development of the shark leather industry the Bureau determined the comparative wearing durability of shark and calf shoe uppers.

Sole Leather. Various types of sole leather investigated by the Bureau to determine their relative wearing qualities.

*Structure of Metals.** Microscopic equipment with samples of metals. Every metal shows in its finer structure, as seen with the microscope, a distinct "personality."

Corrosion of Metals. Samples: Exposure of a metal to the air while wet often results in corrosion. This fact forms the basis of the "wet-and-dry" corrosion test, developed at the Bureau of Standards. The specimens are dipped into the corrosive liquid every 15 minutes being exposed to the air to dry between dips.

High Temperature Strength of Metals.—This apparatus subjects metals at constant temperatures to fixed loads for long periods. The strength is measured at frequent intervals.

A Hardness Tester. One of the fundamental and useful properties of a metal is its hardness. This machine measures the hardness by recording the depth of the impression made by a fixed load on a definite shape of penetrator.

Fusible Plug Blow-Out Testing. Fusible plugs are intended to guard steam boilers against the danger of low water. The apparatus shown was designed and constructed at the Bureau of Standards to test fusible plugs under approximate service conditions.

Determination of Gases in Metals. Gases are present in nearly all metals.

*High-Frequency Induction Furnace.** In this furnace, heat is produced by energy transmitted a short distance through space by electric currents of a frequency slightly lower than those used in radio communication, without the use of connecting wires, or the radiation, convection, or conduction, of heat.

Raw Materials for Pottery. Two of the many possible varieties of each principal raw material used in the production of pottery.

Pyrometer Tubes. These tubes protect the delicate and expensive thermo-elements used in measuring operating temperatures of pottery kilns, metallurgical furnaces, etc.

Spark Plug Porcelain. The modern so-called "sillimanite" spark plug body was developed at the Bureau of Standards. The exhibit showed the various types of test specimens used in developing this body: (a) Used in determining resistance to the conduction of electricity at high temperatures such as obtain in an automobile cylinder; (b) used in determining mechanical strength; (c) used in determining proper temperature at which to burn the body to obtain desired structure.

Half Pot of Optical Glass. Optical glass is made by melting pure sand mixed with other chemicals in special clay pots. The time required is about 30 hours. The temperature is often as high as 1,427°C. (2,600°F.). The glass is cooled in the pot and the exhibit represented a "good break."

*Optical Glass—Good and Bad.** One of these pieces of optical glass contains numerous "seeds" or small bubbles and many "striae" or cords. The other is free from these defects and is eminently satisfactory for high precision optical instruments.

*Reflections in Optical Glass.** A piece of borosilicate crown glass illuminated to show its brilliance and freedom from color. Glass of this kind is employed extensively for making prisms which are used (instead of mirrors) to reflect light in optical instruments.

*Strain Finder.** Good optical glass should be free from strain, or "well annealed." Also, most all ordinary glass should be well ennealed. The apparatus illustrates one method for measuring the degree of annealing of glass. Examples of various types and degrees of strain were visible.

*Effect of Striae (Cords) in Optical Glass.** Striae or cords in glass are threads, sheets, or bands of glass whose composition is slightly different from that of the surrounding glass. They are present in practically all ordinary glass, but not necessarily objectionable. Optical glass, however, must be free from striae because they may cause blurred images.

Softening-Point Furnace. Cross section of a furnace developed at the Bureau of Standards for determining the temperature at which clay and other ceramic minerals soften or melt.

Mullite Fire Brick. Mullite ($3Al_2O_3 .2SiO_2$) brick made and tested at the Bureau of Standards show a resistance to cracking, deforming, and melting at high temperatures which is considerably better than the average product of the fire-clay type.

Insulating Brick. These brick are so manufactured as to be very porous and also sufficiently resistant to heat so that they can be used to "back up" the fire brick walls of kilns, furnaces, and boiler settings.

Clay Tank Block. These blocks, made of clay and burned, are used in constructing large tanks for melting glass.

Cast Glass Pot. The slip (clay-water mixture) required to cast this pot weighed 3,000 pounds. It is probably the heaviest shape ever made by casting clay in a mold. It was made for use in a special investigation of optical glass manufacture.

Enamelled Cast Iron. These samples were enamelled under the same conditions with the same enamel. The poor one illustrated one of the difficulties encountered in enamelling cast iron.

"Fish-Scaling" of Sheet Steel Enamels. The samples illustrated "fish-scaling," a defect which sometimes occurs in enamelled sheet steel, and results in considerable waste of time and material.

Flotation of Enamels. Samples of enamels for sheet steel suspended in water for application.

Colored Enamels for Sheet Steel. Colored enamels made at the Bureau of Standards. These represented a few of the basic colors in which numerous shades and tones were also obtained.

Vitreous Enamels for Cast Iron. Samples illustrating the wet process, developed by the Bureau of Standards, which makes it possible to handle a number of pieces at one time, thus increasing production and reducing manufacturing costs.

Flow Table. Apparatus used to compare the consistency of cement mortars.

Mechanical Analysis of Portland Cement. This tube contains a Standard Fineness Sample issued by the Bureau of Standards for testing No. 200 sieves, separated into fractions of definite grain size by the air analyzer.

Air Analyzer. An apparatus for determining the gradation of cement and other powders between the No. 200 and No. 2000.

Manufacture of Lime. Samples showing how the time and temperature of burning the different limestones affect the properties of the resulting lime.

Steaming Sand-Lime Brick. Bricks showing the effect of duration of steaming on the properties of the brick.

Sand Grading for Sand-Lime Brick. Two bricks showing the effect of grading of sand on the properties of the brick.

Plastic Gypsum. Sample.

Which Sized Pipe? Three-inch soil pipe is better than four-inch for ordinary house plumbing systems, according to the Plumbing Committee (appointed by Secretary of Commerce, Herbert Hoover).

Correctly Built Fireplace. This section of the fireplace built as advised by the Building Code Committee appointed by Secretary of Commerce. The diagram showed why it will not smoke. The flue lining

PLATE 237.—Wind tunnel, model homes, glass pot and smokeless hearth.

PLATE 238.—Ship models and other exhibits of Steamboat-Inspection Service.

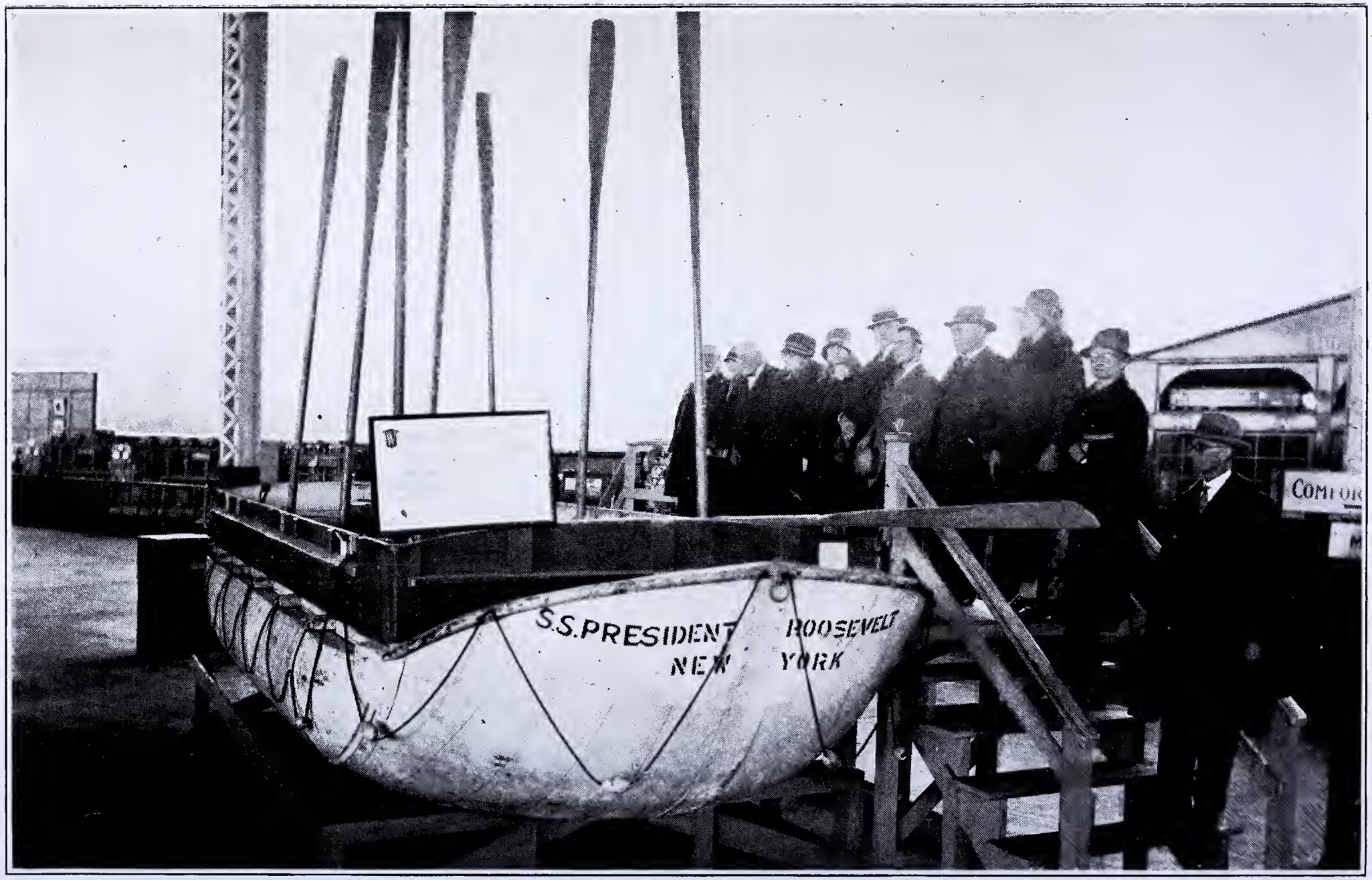

PLATE 239.—Lifeboat of S. S. Roosevelt that rescued crew of British steamer Antinoe in mid-Atlantic, January, 1926.

protects against fire and makes the chimney last longer. Burnable material is kept away from the chimney by incombustible materials. (Plate 237).

Models of Homes. Models of homes made from designs by the Architects Small House Service Bureau (Inc.), controlled by the American Institute of Architects and indorsed by the United States Department of Commerce.

*Exhibits in operation.

Steamboat Inspection Service

The exhibits of the Steamboat Inspection Service were located on a space 30 feet by 26 feet adjacent to the exhibit of the Bureau of Navigation. The lifeboat of the S. S. *Roosevelt*, rescuer of the British steamer *Antinoe* because of its size, was placed on a space near the United States Shipping Board and Bureau of Mines. On account of its historical interest and attractive power, this life boat was made a feature exhibit.

The Service emphasized safety first at sea, showing how the public can have assurance that the vigilance and surveillance exercised by the Federal government afford a high degree of safety in maritime transportation. Ship models, samples of defective materials discovered on inspections, navigational equipment, signal devices, safety equipment, and protective agencies of many kinds constituted the general display. (Plate 238). Various documents, notably "Mark Twain's" pilot license issued to him by this Service in 1859, were displayed to give an insight into the regulatory work of the service. The international signal code flags festooned above the section lent a lively note of color.

Lundin Life-boat and Equipment.—One of the lifeboats with full equipment, which was instrumental in saving the lives of the crew of the British steamer *Antinoe* in mid-Atlantic in January, 1926, by the S. S. *President Roosevelt.* (Plate 239).

A vivid reminiscence of the value of preparedness for "safety last."

Open Type Life-boat.—Constructed to meet all the requirements of the Steamboat Inspection Service and fitted with regulation air tanks and full equipment, among which were emergency rations, water breaker, sea anchor, compass, full sail and all appliances for an efficient life saver at sea.

Life Float.—Regulation A. B. C. life float. This type of life float is required to sustain for a continuous period of 24 hours a load placed upon the submerged platform of at least 20 pounds for each person capacity of the float.

"Greater Detroit" Model.—Magnificent model of one of the finest and largest side wheel passenger steamers in the world where safety

and comfort of travel are exemplified. Pride of the Great Lakes, complete in every detail. This vessel with her sister ship, the *Greater Buffalo*, made regular trips between Buffalo, N. Y., and Detroit, Michigan.

Car Ferry Model.—Passenger car ferry steamer *Pere Marquette, No.* 18. This type of vessel operates winter and summer on the Great Lakes, transporting whole passenger trains with the passengers and baggage. The vessels are staunch and seaworthy, built to combat the elements of severe storms, never run for shelter, and often force their way through twenty-four inches of ice during winter months.

"S. S. Malolo" Model.—The new S. S. *Malolo*, building at Cramps Shipbuilding Company, Philadelphia, Pa., for ocean service. This vessel is to be the largest and finest passenger ship ever built in the United States for ocean service.

Beam Engine.—Model of a beam engine, the type used with success and economy on side wheel steamers for years.

Steering Wheel.—Wheel with standard for controlling the ship's rudder in maneuvering the ship.

Binnacle and Compass.—This instrument is found on the ship's bridge, and by it the navigator is able to determine the direction his ship is traveling.

Hand Pelorus and Azimuth Attachments.—Consists of various devices and instruments, sight vanes, shadow pins, dumb compass, etc., used for observing bearings of celestial or land objects, and determining the deviation of the compass.

Hand Compass Reading Glass.—An attachment of steering compass to facilitate the work of guiding the ship.

Hand Sounding Machine and Depth Gauge.—Designed for use in determining the depth of water under ship at full speed.

Helm Angle Indicator.—Designed for use on the ship's bridge to record the exact position of the ship's rudder at all times.

Mechanical Telegraph.—Designed for use on the ship's bridge, this instrument conveys, records, and returns the engine working signals.

Revolution Counter.—Designed for use on the ship's bridge, this instrument records every revolution of the main driving engines, also indicates whether the engines are working ahead or astern.

Clear View Screen.—Designed to aid the navigating officer with clear vision in various atmospheric conditions.

Shoulder Gun.—Required in the equipment of the ship to be used for propelling a line-carrying projectile.

Line-carrying Gun.—A line gun of the cannon type with a line attached, and must carry and 18-pound projectile a distance of 1,400 feet

without breaking or fouling the line. These instruments are used to throw a line to shore or over a ship at a time of disaster.

Running Light.—Red and green side lights and white head light required on board ship at night to indicate the bearing and angle or direction the ship is traveling.

International Signal Code.—The international code of signals consists of twenty-six flags, one for each letter of the alphabet, and a code pennant, used by licensed officers for communication between ships and land stations.

Sextant and Quadrant.—Last word in navigational instruments used by licensed officers aboard ship for finding their way at sea.

Old Sextant and Quadrant.—Interesting instruments last used in 1862 on the old clipper bark *Cora* on a mutinous voyage to China.

Shipping Bill.—Issued in 1862 at Shanghai, China, to the clipper bark *Cora*.

Old Log Book.—Savors of rum, "old salt" and mutiny cover the interesting pages on which are logged the eventful voyage of fighting, sickness, and death on the clipper bark *Cora* en route to China in 1862.

Fire Extinguishers.—Soda and acid, foam, tetrachloride, and pump gun fire extinguishers in whole and in halves, showing the interior construction. Efficient means and sure death to fire.

"Mark Twain."—Original license as pilot issued to Samuel Clemens, "Mark Twain," by the U. S. Steamboat Inspection Service on April 9, 1859.

Markings of the Lead Line.—Work of "Mark Twain" while a pilot on the Mississippi River. This well known and famous marking and reading of the lead line soundings are used to this day by river pilots.

Work of the Teredo Worm.—Wood from the hull of steamer *Julia Belle Swain*, after only eight years of service, bored and honeycombed to destruction by the teredo worm.

Wood Ship Material.—Taken from the sunken river steamer *West Newton*, under water in the Missouri River for over fifty years. The wood shows full thickness with no evidence of deterioration.

Scenic Plaque of Alaska.—Water transportation and beauties of Alaska shown in a scenic plaque of splendid work by Mr. Wilson Blaine, formerly clerk to the St. Michael, Alaska, Board of Steamboat Inspectors.

Inspectors' Tools and Instruments for inspecting vessels and boilers. Long and short prods for digging into the hull planking and frames of wooden ships.

Auger for boring wooden ships.
Pump and gauge for testing air tanks in lifeboats.
Nozzle and relief valve for testing fire hose.
Hammer for testing steel.
Gauges for measuring steel.
High pressure gauge for boiler test, and various other tools and instruments used.

Life Preservers and Ring Buoys.—The life preservers are of the jacket form, full block cork, heavy duck covered, and regulation sewed.

The ring buoys were regulation size and constructed of block cork.

Defective Material Found on Inspection.—Life preservers condemned on inspection for broken cork, decayed covering and straps.

Defective timber from the hull of ships.

Deteriorated metal from steel ships and metal lifeboats and several specimens of rust in large sheets held together by paint and detected by the keen eye of inspectors.

Defective Boiler plate.—Deteriorated plate cut from a boiler on the steamer *America.* Many pieces of boiler plates and attachments were shown, that signify the rigid inspection required on boilers to assure safety to life and property.

Certificates of Inspection.—Issued by the Steamboat Inspection Service to the river steamer *Robert E. Lee* of the famous "*Robert E. Lee and Natchez*" race.

Certificate of inspection issued at Detroit, Michigan, in 1854, to the steamer *Forester.*

Large Oil Tow.—Large photograph of the steamer *Sprague* with the largest tow of oil barges ever handled on the Mississippi River—224,000 barrels of crude oil.

Delineascope Picture Machine.—Displayed on a screen many phases of the work of steamboat inspectors and details of interest aboard ship, among which were lifeboat test, davit and falls test, testing air tanks of lifeboats, life raft inspection, lifeboat drills, life preserver inspection, life preserver drill, fire apparatus inspection, fire drills, boiler inspection, steel inspection at the mills, boiler tube inspection, dry dock inspection, results of vessel collisions, damage to vessels by grounding, and the interesting comparison of only one passenger lost for every 5,832,076 passengers carried on board ship.

National Committee on Wood Utilization

This Committee, cooperating closely with Departmental authorities was assigned space in the center of the section occupied by the Bureau of Standards. The inner and outer walls of an open booth presented

PLATE 240.—Standardized fireplace and part of exhibit of National Committee on Wood Utilization.

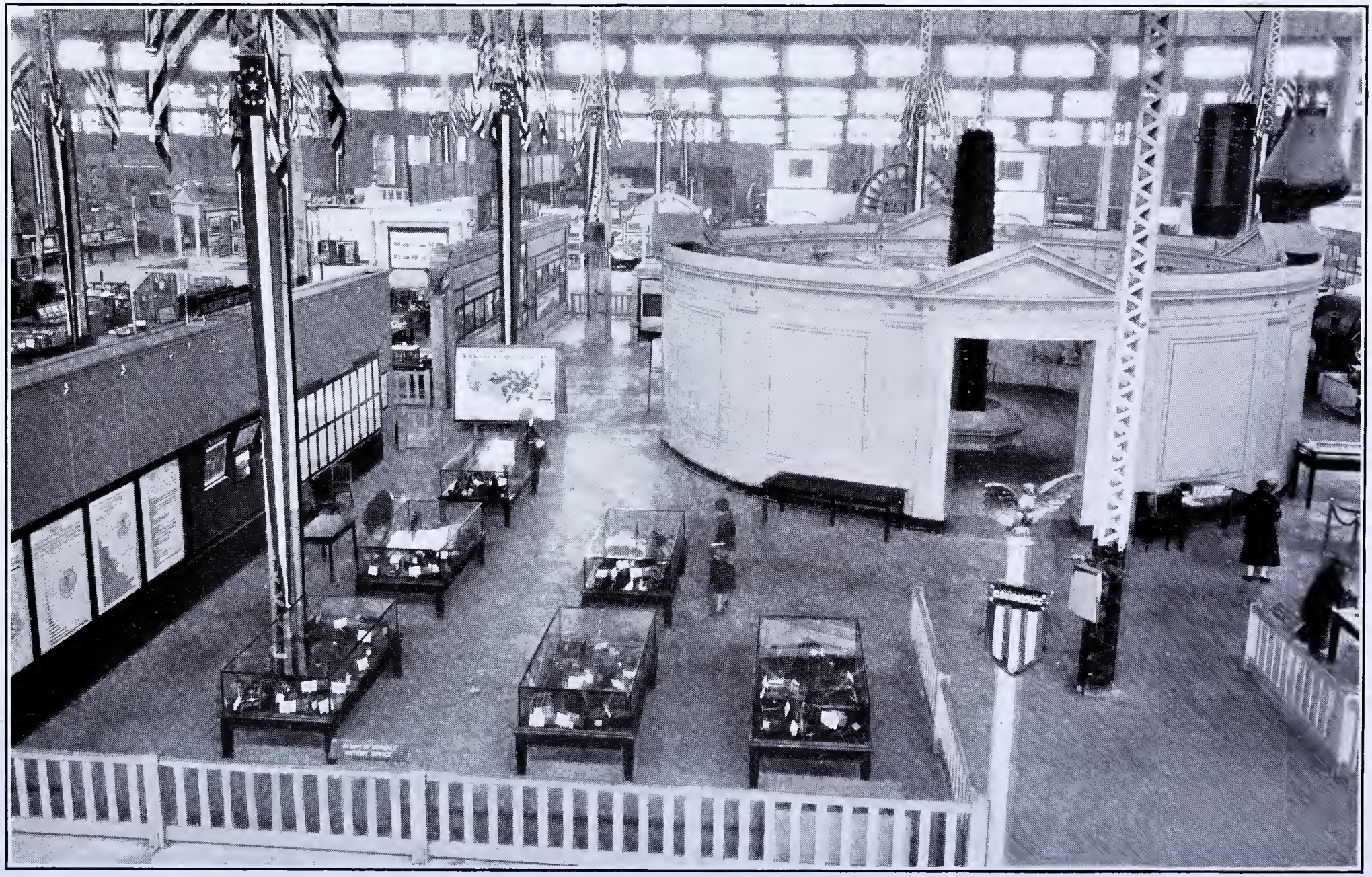

PLATE 241.—Close view of Patent Office model cases—Exterior view of central gallery.

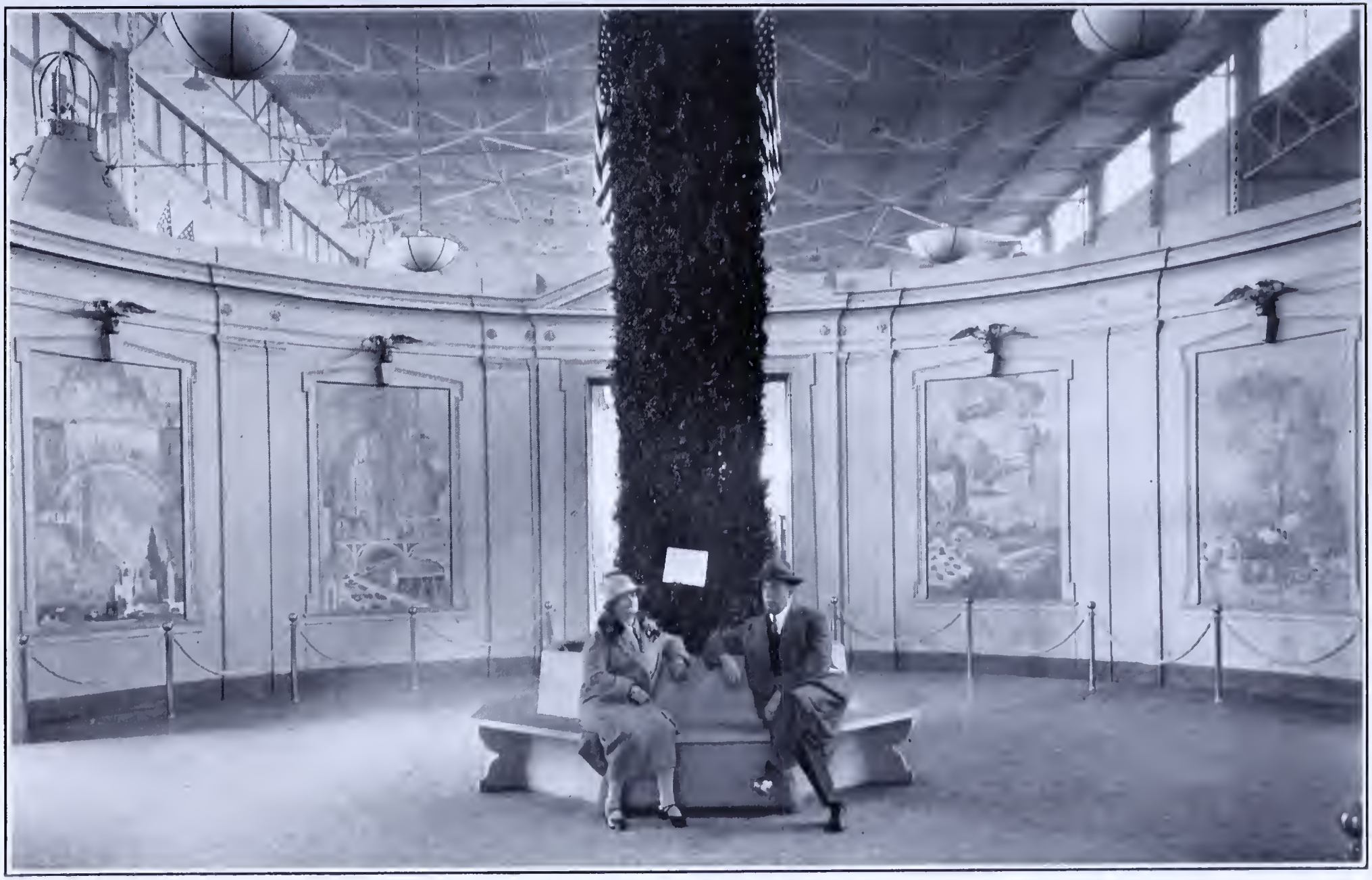

PLATE 242.—View of central gallery.

exhibits of former wood-wastes doing service, and methods for the closer utilization. (Plate 240).

The Departmental exhibit as a whole was indebted to the National Committee on Wood Utilization for the thousand-foot balustrade, (a special exhibit in itself) laminated panels in the partitions, and the contrasting birch and maple hardwoods of the floor of the central gallery. (Plates 241 and 242).

Insight into the promotive work of the Committee was afforded the visitor by the exhibits described in detail below:

Statement regarding features of the exhibit, with explanatory notes.

Blue Stained and Knotty Lumber.—The efficient utilization of blue stained and knotty lumber was effectively demonstrated in the wooden fence that surrounded the entire Department of Commerce exhibit. When covered with paint this material was shown to be equal to clear high grade material. Another feature of the fence was the end matched construction.

Hardwood Flooring.—The flooring in the central area of the Department of Commerce exhibit of maple and birch indicated the use of short length material, which has long been in practice with hard-wood flooring, and further indicated the possibilities of like practices in the use of softwood flooring.

Plywood Panels.—The large Douglas fir panels used in the partitions of the Department of Commerce exhibit were made of three-ply veneer and indicated the beautiful figure and large areas of clear material obtainable in plywood panels.

Short-length End Matched Pine Flooring.—The flooring of the booth occupied by the National Committee on Wood Utilization was made of end matched pine, none of which was over 38 inches in length. It showed the possibility of utilizing short length flooring, and further indicated the possibility of using knotty material where the floor is covered with a rug.

Laminated Door.—This door with a constant stream of water cascading over its one face proved the efficiency of the laminated or "built up" door, which is made of small blocks encased in veneer and using plywood panels. Shrinking, warping, and swelling is reduced to a minimum by this construction.

Chart.—Bar chart indicating the quantity of lumber used by various industries.

Wormy Chestnut.—Wormy chestnut efficiency utilized as a core for plywood. Oak or other veneers are pasted on to the less expensive wormy chestnut, the holes of which act as reservoirs for additional quantities of glue.

End Matched Lumber.—Siding, ceiling, flooring, and other types of lumber indicated the tight joint and absence of the necessity of trimming to meet studs when this material is properly end matched.

Grade Marked Lumber.—Samples of grade marked lumber were displayed together with placards urging the lumber consumer to protect himself by purchasing grade marked lumber. Pictures of grade marking devices were also shown.

Wood Distillation Products.—Products were shown of steam distilled Southern pine, including turpentine, rosin, and various pine oils and tars.

Synthetic Lumber and Wallboard.—A tough hard, fibrous product made from wood chips and mill ends, etc., that have been exploded into fibre and again united into boards, under extreme pressure.

Insulating Material.—A felted material made from wood, which is used as an insulating and sound-deadening material.

Kraft Paper.—Several steps in the manufacture of Kraft paper from Southern pine. The steps included the chipped wood, the raw pulp, and a number of various grades of kraft or wrapping paper.

Useful Products from Slab Wood.—The exhibit was a section of slab which heretofore has been wasted, together with broomsticks, laths, and other products now obtained from these slabs by careful resawing.

Wood Flour Products.—Some of the more important products in which wood flour is one of the principal constituents, including linoleum, dolls, dynamite, and oatmeal wall paper.

American Lumber Standards.—A chart indicating in cross-section the numerous sizes of lumber sold as 2 x 4's, and in contrast the two standard sizes as advocated by American lumber standards.

American Commercial Woods.—A rack showing thirty-two of the principal species of American lumber.

Saw-tooth Exhibits.—A graphic presentation of the waste caused by sawing lumber with saws of various gauges; showing the comparatively small loss by thin band saws and the enormous waste by wide gauged circular saws.

Knotty Oak.—A panel indicating the beauty and individuality of knotty oak when used for indoor decorating purposes. A picture of knotty pine as interior trimming in one of Chicago's newest theaters was also displayed.

Rayon.—Eleven steps in the manufacture of rayon were indicated by samples and diagrams of the product from the raw wood to the finished lustrous yarn.

Timber Chips.—A patented device consisting of a steel plate with teeth-like projections, used to add rigidity to timber structures.

Model Roof.—Model roof made of standard-sized short-length lumber. This roof is made without trusses, and each piece is bolted together according to a patented scheme.

A Scientifically Constructed Crate.—A crate of improved design, showing saving of lumber and reduction of weight without sacrificing strength.

French Lumber-piling System.—A model showing improved construction of lumber pile that resulted in better drying and reduced handling costs.

Preserved Wood.—Sections of treated wood that gave long length of service when used in exposed situations, together with several pieces of untreated wood that quickly fell pray to marine borers.

THE DEPARTMENT OF LABOR

THE DEPARTMENT OF LABOR

Foreword

The exhibit of the Department of Labor was located along the south wall of the Government Palace, extending from the southeast corner westward for nearly 250 feet. It was a very popular exhibit because it dealt with subjects of deep interest to all wage earners, such as the improvement of the working conditions of both men and women, advancing their opportunities for profitable employment, securing equable relations between employers and the employed, and the health of children.

Child welfare was given particular emphasis both in extent and character of its presentation through the Children's Bureau. With its health conferences with mothers about the care of their little ones, and the child clinics demonstrating the usual methods practiced in health examinations, the Children's Bureau received marked attention. The demonstrations were conducted in a pavilion so constructed that all the operations could be plainly seen from the outside by the visitors. This was one of the liveliest of "live" exhibits. The antics of the babies, in play or in protest, were often very amusing while some of the older ones loudly voiced their resentment at the proceedings, doubtless saying most uncomplimentary things about the Sesqui in general and the Children's Bureau in particular.

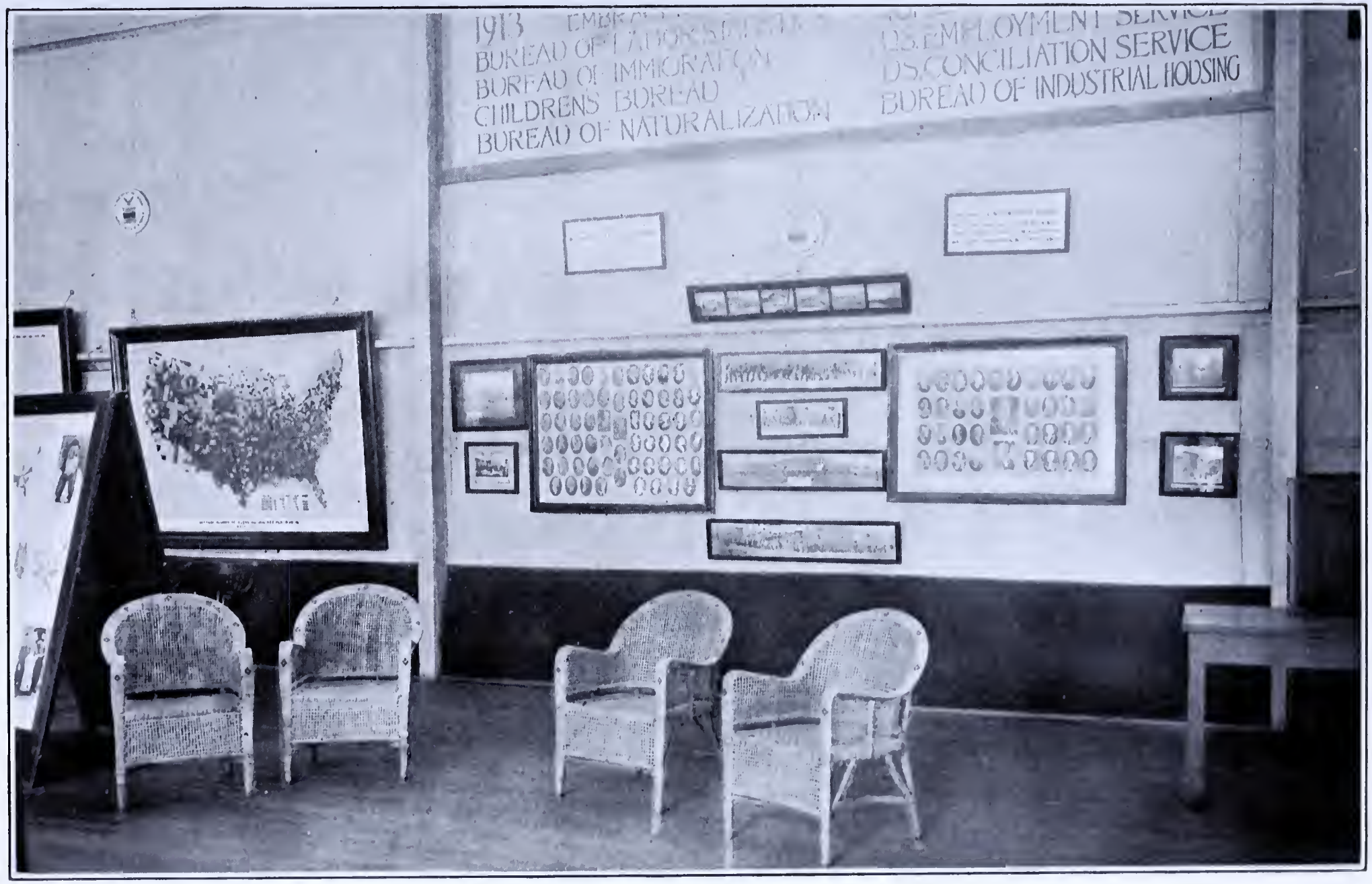

PLATE 150.—General view of exhibit of the Office of the Secretary, Department of Labor.

PLATE 151.—General view of the exhibit of the Bureau of Naturalization.

Exhibits of the Department of Labor at the Sesquicentennial Exposition. 1926

Introduction

The exhibit of the Department of Labor was of much interest to visitors and received favorable comment generally. Thousands requested information relative to the Department of Labor and the work it is doing for the wage earners in the United States.

Description of the Exhibits

Office of the Secretary

The exhibit of the Secretary's Office, so situated that it was surrounded by the exhibits of the Women's Bureau, Bureau of Naturalization and the Children's Bureau of the Department of Labor, served both as a reception room and an information booth. (Plate 150). Easy chairs were arranged about the room with a table in the center on which were placed for distribution, pamphlets giving the history and sketches of the various activities of the Department. Visitors were also supplied with lists of publications issued by the Department and a well-informed attendant was always on hand to supply any additional information desired.

Included in this exhibit were a large sign naming the various bureaus and divisions of the Department; pictures showing activities of services other than those having specific exhibits of their own; scenes from the Immigration Service; scenes showing numbers of persons affected by strikes and lockouts; and two large frames, one containing a picture of the Secretary of Labor, 1913 to 1920, surrounded by the Commissioners of Conciliation who served before and during the war period, and to the right of that, the second one showing the present Secretary of Labor surrounded by the Commissioners of Conciliation who served during the readjustment period, and are still in the service.

Bureau of Naturalization

The purpose of the exhibit of the Bureau of Naturalization (Plate 151) was to illustrate graphically the benefits accruing to alien applicants for citizenship and the country at large as a result of the passage by Congress in 1906 of "An Act to provide for a uniform rule for the Naturalization of Aliens throughout the United States." To illustrate one of the advantages secured through this Act, the Bureau displayed

in two exhibit frames copies of naturalization papers issued prior to 1906 showing that there were in existence at that time almost as many diversified forms of naturalization papers as there were naturalization courts. In these same frames were displayed, for comparison, the single, standardized forms of declaration, petitions, and certificates now supplied by the Bureau of Naturalization to all courts exercising naturalization jurisdiction throughout the country. In this connection, it may be stated that prior to the Act of 1906, all naturalization records were on file only in the numerous courts exercising jurisdiction. Since the effective date of that Act there has been filed with the Bureau at Washington a duplicate copy of every declaration, petition and certificate of naturalization issued. There is, therefore, to the person naturalized under the Act of 1906, a security of title to his political or national status never before enjoyed.

Colored photographs showing native costumes of the principal nationalities making up the alien population of the United States were displayed in five exhibit frames. In these same frames were also displayed maps illustrating the distribution, by States, of these several nationalities.

There were two large maps of the United States on the rear wall of the exhibit space; one illustrated the organization of the Naturalization Field Service into twenty-three districts, showing the geographical boundaries of each district and the cities in which headquarters are located; the other map showed the average number of aliens naturalized in each of the counties of each State of the Union. This exhibit showed that the greater part of the alien applicants for citizenship reside in the northeastern and middle western States.

A large chart, also on the rear wall of the exhibit space, showed by a graphic scale, the number of declarations and petitions filed and certificates issued during each of the fiscal years 1907 to 1926, both inclusive. This graphic illustration showed that the high tide of naturalizations occurred just preceding and immediately following the entrance of the United States into the World War. On this same chart, the percentages of the numerous nationalities that were naturalized during the fiscal year 1925, was graphically illustrated. This showed that aliens of Polish extraction lead the list with the Italians a close second, the two combined totaling over a third of the entire number naturalized.

The number of certificates of naturalization issued in each of the several States during the fiscal years 1907 to 1925, both inclusive, was also shown on this chart. The State of New York leads the list, with the State of Pennsylvania, second.

PLATE 152.—A view of the "Children's Pavilion" in which a well-child health conference was conducted by the Children's Bureau.

The Bureau of Naturalization compiled and printed for special distribution to visitors at the Sesquicentennial, a pamphlet entitled "Historical Sketch of Naturalization in the United States." This publication outlines briefly the progress of naturalization in this country through its several stages, and the situation as it exists today; the organization of the Bureau and its field force and some of the beneficial results accomplished under the Act of 1906, and its several amendments.

Children's Bureau

In planning its exhibit, attention was centered upon a children's health conference, conducting demonstrations to illustrate not only the scope and nature of such conferences, but also the standards which should obtain in their operation. The demonstration also gave a glimpse of an important type of activity sponsored by 43 States under the Federal maternity and infancy Act. As indicated by the word "demonstration," the purpose of the exhibit was not to make hasty examinations of great numbers of children, but to conduct careful examinations of a few in accordance with approved standards.

Accordingly, plans were drawn by the bureau for a "Children's Pavilion" which should adequately house the health conference, and at the same time harmonize with the general spirit of the Exposition. The building erected provided a reception room, dressing rooms, and clinic room, with glass doors and sash windows, in order to give the public full opportunity to see the activities going on within. (Plate 152). The color scheme was one of pastel shades, pale green, lavender, and blue. The equipment for the conference was simple, white washable furniture, small chairs for the children, comfortable wicker chairs for parents, a large examination table for the physician, small tables holding a scientifically designed measuring board for babies and a baby weighing scale, a floor scale, measuring strips tacked to the wall for measuring the height of the older children, and, in the dressing rooms were small tables on which babies might be undressed. Posters were hung on the walls, an infant's layette and a maternity outfit were displayed.

The staff of the conference included a physician, a graduate nurse with public health experience, and a clerk. The procedure followed briefly was as follows: Parents entered the pavilion through a center door leading directly into the reception room, where the nurse received them and filled in the record sheet with a full family and personal history, including a habit history. The mother then went with the child to the dressing room, took off its clothes, which were put in a paper bag provided for the purpose, and placed a square of canton flannel

PLATE 153.—Examination room of the clinic, where a well-child health conference was conducted by the Children's Bureau.

(cut with an opening in the center for the head) over the child's shoulders. Since appointments were made in advance, and at least 30 minutes were allotted to each child, it was possible for the nurse also to weigh and measure the child and to enter this information on the record sheets before the child was examined by the physician. The weighing and measuring were done in the clinic room and the child then went to the doctor.

Both parents were usually present during the examination, which was made, in spirit, a real "conference" between parents and physician. The record sheet was completed during the examination and at the end each child received a "tag" on which were written his name, age, the date, his height and weight, the normal weight for that height, and any remarks which might be of help to the parents. The examination itself included body measurements, consideration of nutrition, muscle tone, activity, speech development, a careful examination of head, bony and muscular systems, eyes, ears, mouth, nasopharynx, glands, lungs, heart, abdomen, reflexes and genitalia. (Plate 153). In talking with parents, the physician advised reference to the family doctor or pediatrician or to an established clinic for future treatment or supervision of the child. General instructions about diet and care, including habit problems, were given the parents directly.

In order to emphasize the important points of the examination for the audience which always gathered outside the clinic room to observe the children, a "mechanical book" was used. The leaves of this book, turning automatically, carried the following statements:

> "Every baby should be weighed once a week and examined by a doctor at least every four months.
>
> "The child over 2 years of age should be weighed at least once a month and examined every six months.
>
> "A complete examination should include study of a child's growth and development, both physical and mental, nutrition and diet, posture.
>
> "Also examination of eyes and ears, nose and throat, heart and lungs, abdomen, extremities.
>
> "An examination is not complete unless the child's habits are studied.
>
> "Many little children have bad habits of eating, sleeping, thumb sucking, nail biting, bed wetting, temper tantrums, disobedience. Does yours?
>
> "The healthy child has good habits. He does not fuss about his food. He eats three regular meals a day and nothing between

meals. He goes to bed early and sleeps 12 hours. He learns to obey if his parents are reasonable and consistent in their demands. He does not have temper tantrums. Parents must work together to help their children form good habits."

A section of the report of the physician in charge, Dr. Caroline E. Whitney, is here quoted:

"The majority of the children examined (about 300 in all) were well children, but under this title of 'well children' are classed those who needed posture training, those who had finicky appetites, those who had eneuresis and those whose parents needed advice as to mental hygiene for the child. A surprising number of the children of school and preschool age had bad posture.

"Of the infants seen, there were a good many who were quite well and whose mothers were giving them excellent care. These mothers were advised to continue as they had been doing. There were other babies who seemed to be in good physical condition in spite of the fact that they were receiving improper diet. The mothers of such children were told the ideal diet for the child and advised to adopt it. Other babies were receiving improper diet and were obviously showing the effects of it in their nutrition. These mothers were also given instructions about the proper diet for such a child and in this group of cases the mother was strongly urged to see her own baby clinic, pediatrician, or family physician for further care and advice. Some mothers of these malnourished infants wished to come back to the clinic for a second visit to see how their baby progressed on the diet advised. This was permitted in one or two cases (which were particularly interesting) since the clinic was only temporary and would not be permanently usurping the privileges of another clinic or private doctor.

"Most of the parents were very much interested in every detail of the examination and were grateful for any advice given. Some parents were encountered, of course, who were definitely antagonistic and resented advice. Those were few. The fathers were often just as interested in the whole thing as the mother.

"Children were seen from each of the following States:

Pennsylvania	Virginia	Indiana
New Jersey	West Virginia	Louisiana
Delaware	Georgia	Also, from the country of Denmark
Maryland	Kansas	
New York	Illinois	
Massachusetts	California	
Maine	Ohio	

"Whenever there was a baby being weighed or measured or examined there was usually a large crowd outside the window even though the aisles had been practically empty a few moments before. The public seem always ready to stop and look at a baby.

"The clinic was conducted as a demonstration clinic and was in no wise meant to act in the capacity of the usual well baby clinic. The actual good done by such a clinic cannot be estimated. In interviewing the parents the value of preventive work in child health was always emphasized. Whenever possible the parents were told about the public health work being carried on in their immediate vicinity. The literature put out by the Children's Bureau was given to each family. Those who actually came inside the Children's Bureau exhibit are certainly now aware of the fact that the United States Government has a department particularly interested in the health of the child."

As a special feature, in addition to the regular activities of the child health conference, a posture demonstration was conducted during one month. Two Philadelphia school children attended the clinic each afternoon to demonstrate the most important of the posture exercises, and special talks were given to groups of parents on posture. Miss Leah Thomas, of Smith College, in charge of the posture demonstration, acted in consultation with Dr. Whitney with relation to children examined at the conference who showed special postural problems.

Several mothers who were unable to attend the demonstrations wrote letters asking for information. Trained nurses made special appointments to gain information regarding the management of posture clinics. School teachers showed interest in new methods of teaching posture in groups. This was encouraging because the group-teaching is the most effective way in which the problem can be attacked in a preventive health program.

During the course of the demonstration a lecture was given to the Supervising Nurses of the City of Philadelphia, and a special demonstration was given for the Physiotherapists working in city hospitals. On the whole, persons of the medical profession and those of the educational world showed equal interest in the posture work.

Because of the fact that there were no arrangements for heating the exhibit building, the Children's Bureau closed its demonstration health conference on the first of November. The nurse in charge of the clinic work remained, however, until the close of the exposition and weighed and measured approximately 700 children during the month of November.

Aside from the health conference and posture demonstrations, the most striking feature of the Children's Bureau exhibit was a large

PLATE 154.—A view of the central entrance to the exhibit of the Children's Bureau.

mural painting entitled "The Child Shall be First." This faced the entrance to the Children's Bureau exhibit. In the foreground of the painting America, a tall and gracious mother, stands in a blossoming fruit orchard, a child on her shoulder and little children playing about in the sunshine in the protection of her presence. (Plate 154).

Each division of the Children's Bureau was represented in the exhibit by a bulletin board which described the work of the division, and by films projected through delineascopes which illustrated maternity and infancy work, the care of the baby, the prevention of rickets through sunbaths and codliver oil, the prevention and treatment of juvenile delinquency through constructive community measures and the work of juvenile courts, the protection of children against the evils of child labor through education, vocational guidance and child labor legislation adequately enforced.

Other features of the Bureau's exhibit, particularly the nursery and playground models, received attention. The former, approximately 4 by 8 feet, was a model showing the interior of a children's nursery in miniature. The latter, approximately 3 by 5 feet, was a miniature reproduction of a five-acre city playground, adequately equipped with swimming pool, tennis courts, baseball diamonds, swings, ladders and flying rings, for daily use by 300 boys and girls.

A "baby fashion show" with dolls in costumes of the 18th, 19th and 20th centuries, borrowed for the exposition through the courtesy of the National Museum from Mrs. Allen M. Sumner and Mrs. Mary Norton Lower, was another feature of the exhibit.

Motion pictures produced by the Children's Bureau were shown in the auditorium of the exhibit palace. These were "Our Children," a film illustrating the way in which one town made itself safe for babies; "Well Born," a motion picture on pre-natal care, and "Posture," a motion picture illustrating the fundamentals of correct posture and the way in which children may attain it.

The exhibit of the United States Children's Bureau demonstrated its purpose and showed some of the important results already obtained. It interested members of the medical profession and public health workers generally.

Women's Bureau

The exhibits of the Women's Bureau at the Sesquicentennial Exposition consisted of four units: (1) a historical presentation of women in industry, (2) a model factory, (3) a display of standard equipment connected with service facilities for women workers, and (4) a demonstration of the problems of wage-earning women.

PLATE 155.—Story of the progress of women in industry and manufactures.

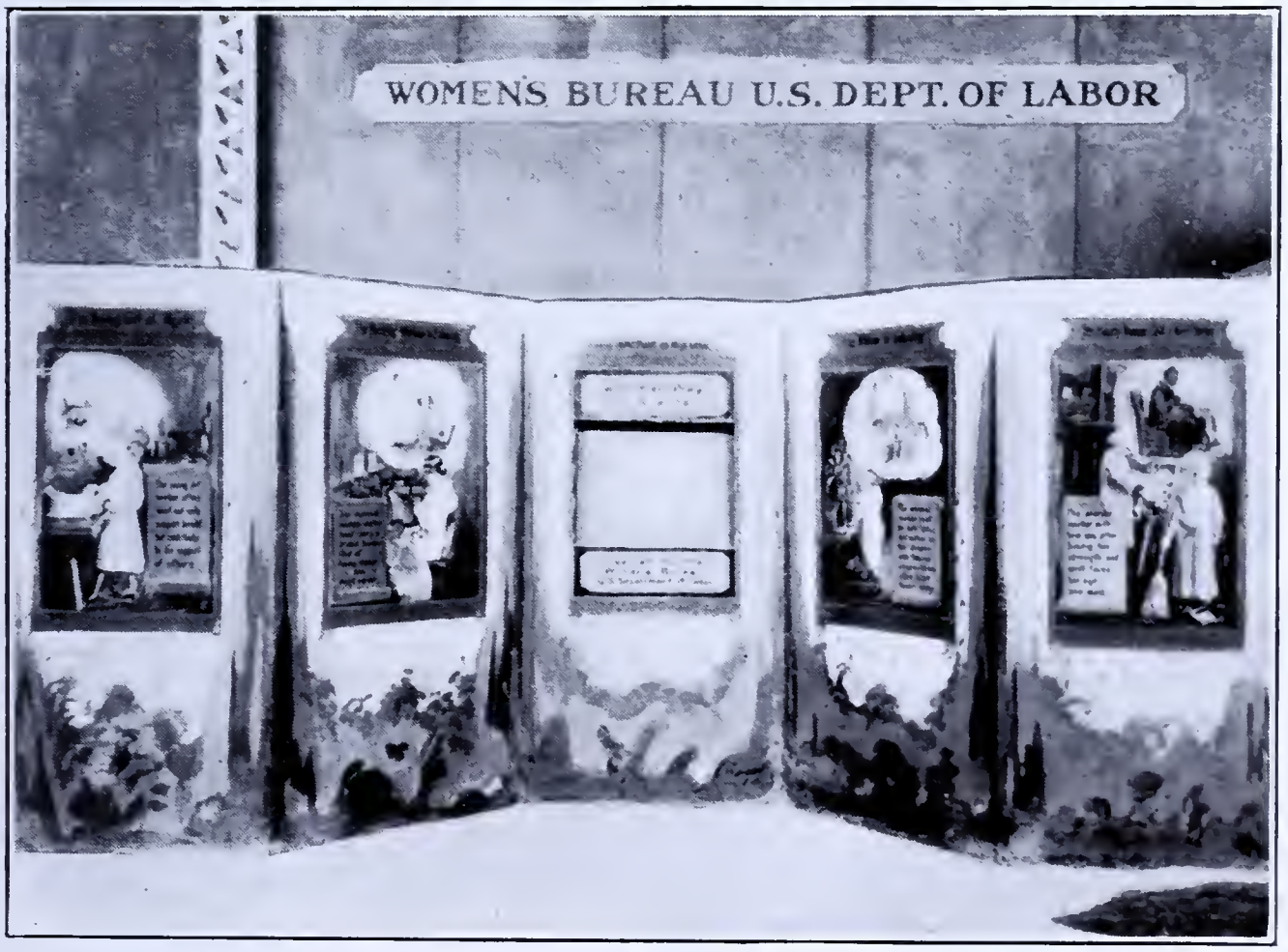

PLATE 156.—Allegory of the Woman Wage Earner—Any Woman.

PLATE 157.—Good Factory Conditions and Fair Wages.

The first unit depicted, by means of paintings and stereopticon pictures, the progress made by women in industry and industrial changes affecting the employment of women. This unit was composed of two large open books flanking a closed book, all five feet in height, displayed on a table. The open books revealed interesting paintings illustrating the manner of the making of textiles in the years 1776, 1876 and 1926. They served to present pictorially the story of women's share in the manufacture of cloth. (Plate 155).

Progress in the manufacture of a number of other products were shown by a series of pictures on a screen (Plate 156) entitled, "A History: Women Who Toil and Spin Through the Ages." The pictures contrasted colonial industrial methods through which "Miss 1776" was supplied with the needs of existence and the more modern but still quaint processes characteristic of industry in the days of "Miss 1876," with the most recent means used by giant industries of today to furnish "Miss 1926" with the essentials and comforts of life. A popular appeal was given to the whole by a portrayal of the ways in which ladies of fashion in three eras were able to celebrate such unchanging Red Letter Days as Thanksgiving, Christmas, Easter, and the Fourth of July, because of the fruitful labors of women workers in each age.

Special emphasis was laid on the part played by modern wage-earning women in economic production, such important industries as the mercantile, food, textile, garment, hat, shoe, printing, telegraph, and telephone being featured. Statistical information giving the numbers employed in various important industries were worked into the story. Finally, reference was made to the origin of the Women's Bureau in 1918 and its function of looking after the interests of the more than eight and one-half million wage-earning women in the United States today, engaged in all but 35 of the 572 listed ways of making a living.

The purpose of the exhibit was to show the great growth in the number of women found in remunerative employment outside the home, the great variety of occupations upon which they have entered, their economic importance to individual industries and to the country as a whole, and the imperative need of a government agency to look after the welfare of women workers in the interest of the race and the nation.

Closely allied with this unit, since so many women now work in factories, was unit 2, which showed a cross section of a factory, with interior views typical of a modern, well-regulated and well-equipped plant. (Plate 157). A 9-foot painting represented a large workroom with women, dressed in proper working uniforms, operating punch presses. Safety devices on the machines, scientifically constructed and carefully adjusted seats for the women, large factory windows furnishing enough light but no glare and permitting proper ventilation of the

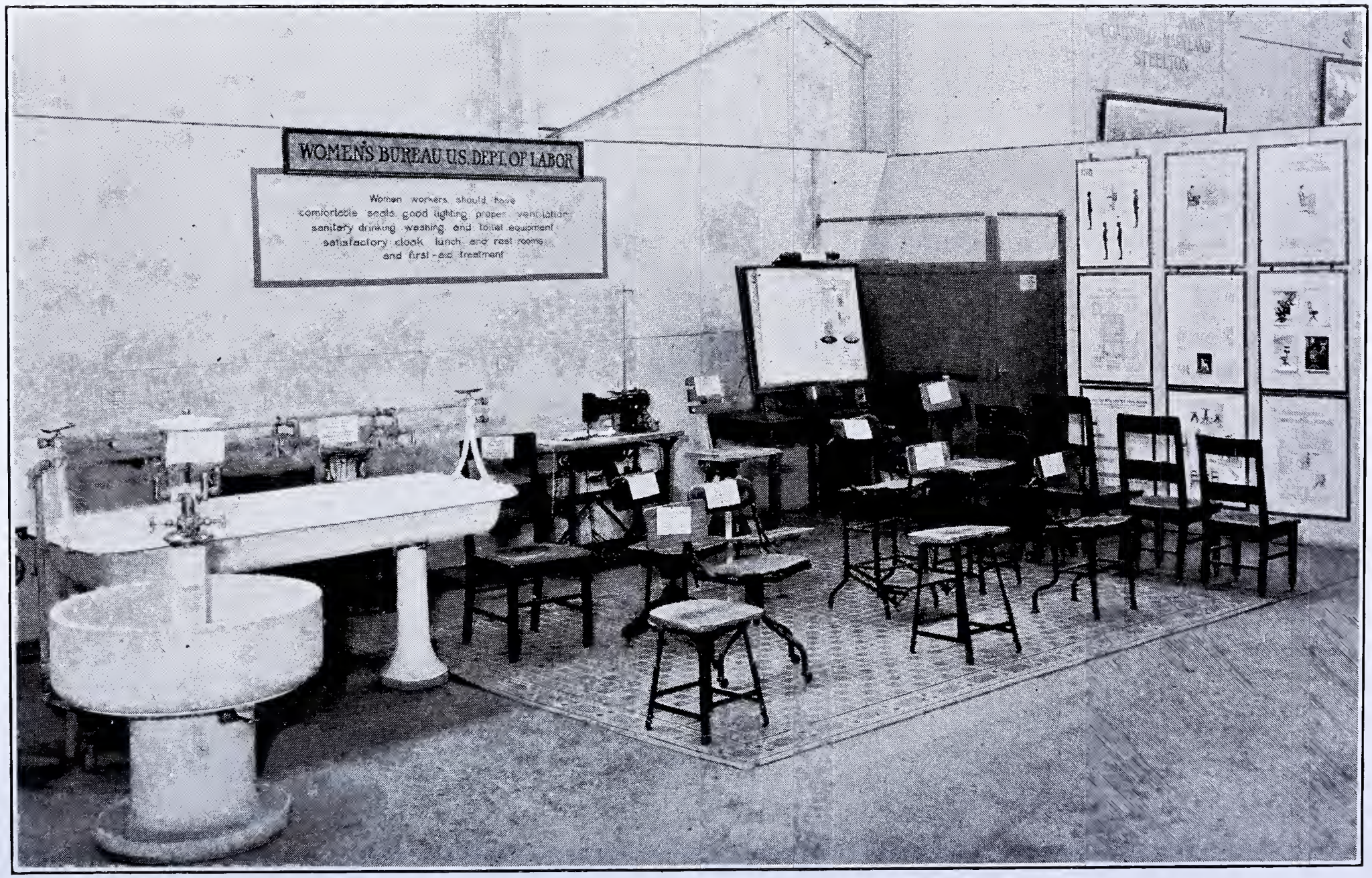

PLATE 158.—A display of actual factory equipment connected with service facilities for women workers.

workroom, and well-shaded artificial lights comprised other important features presented. Paintings of a sanitary lavatory and toilet room, of a hospital room, and of a recreation room served to give a general idea of some of the modern service facilities supplied for women employed in progressive plants. An interesting feature in the recreation room was a motion picture shown on a small screen by means of an automatic machine placed behind the scenes. The film entitled "The Woman Worker Past and Present" contrasted women's industrial activities in the home in a former era with their occupations in modern factories, and depicted the benefits that have come to society from modern wholesale manufacturing, together with certain resultant hardships for the women engaged as wage earners outside the home. The ways in which these difficulties might be removed, the need for more widespread progress, and the efficacy of good legal standards for women workers were graphically set forth.

In order to give a more realistic idea of equipment used in factories to promote the comfort of women employees, the third unit was planned. It consisted of actual factory equipment, such as model seats, first-aid cabinets, and sanitary drinking, washing, and toilet facilities, lent to the Bureau by various manufacturers. (Plate 158). It was hoped by the Bureau that these models would be of particular interest to employers. In this booth was displayed an automatic book with six large hand-painted illustrations of good and bad working conditions for women in industry—wages, working hours, sanitation, service rooms, (lunch, rest and cloak rooms), lighting, and seating being the subjects treated.

Units 2 and 3 were designed to illustrate the standards which the Women's Bureau advocates for women workers. The Bureau aimed to inform the public of the greater need for control of standards of women's employment because women have been in a weaker position economically than men. The Bureau desired to emphasize the importance of safeguards to conserve alike an industrial efficiency and the health of the women and to make it impossible for selfish interests to exploit women as unwilling competitors in lowering those standards of wages, hours, working conditions, and industrial relations which are for the best interests of the workers, the industries, and society as a whole.

Moreover, the Bureau realized the importance of calling to the attention of the public the problems of women in industry, not only because women are producers of economic goods, but also because, as mothers or potential mothers, they are producers of future citizens.

If industrial forces are permitted to draw too heavily upon the time and energies of women employees, then industry becomes a menace not only to them as individuals, but to their children. Consequently, unit 4 was closely related to the other units, since its purpose was to present in graphic and dramatic form the problems of women wage earners. This exhibit consisted of five bill boards, the central one bearing the following caption:

"The Home Maker as Wage Earner. A Problem Play in 4 Acts.
Produced by the Women's Bureau, U. S. Dept. of Labor."

Under this caption was a screen on which were shown, by means of an automatic stereopticon, an allegory, illustrated by clever and arresting pen and ink sketches that told the story of a young girl forced to become a wage earner, vividly portraying the trials and misfortunes that she experienced in her journey through life due to the demands made upon the wife and mother and the trying conditions she had to face in the field of labor.

The central panel of this exhibit where the preceding story was told was flanked by two other bill boards, showing paintings of the various types of wage-earning women, at home and at their jobs—the young girl, the married woman, the widow, and the older woman. (Plate 159).

Grim as this story was, the Women's Bureau in its investigations has found it typical of thousands of women workers in the United States today. The Bureau is faced with the many and complicated social and economic problems of wage-earning women, which add greatly to the complexity and variety of its work. Firmly convinced of the truth of the slogan, "America will be as strong as her women," the Bureau aims to use every educational means of informing the public of the need for giving more careful attention to the subject of wage-earning women, and the Bureau's exhibits at the Sesquicentennial Exposition were considered an excellent opportunity to present important truths on this subject, and were designed with this purpose in view.

THE SMITHSONIAN INSTITUTION

THE SMITHSONIAN INSTITUTION

Foreword

With a purely educational aim in view, the exhibit of the Smithsonian Institution at the Sesquicentennial was a splendid demonstration of the value of these methods. As presented, it was like a section removed bodily from the great Museum in Washington.

The selection of material was peculiarly fitting to the celebration of the one hundred and fiftieth anniversary of the Nation's Independence. The earliest evidences of life taken from the earth's strata hundreds of millions of years old, fossil plants and animals of more recent geologic periods imparting bits of history on the development of our continent before the waters were separated from the land, the earliest known record made by man in the Western Hemisphere, illustrations of the modes of life and the crafts of the aborigines of the country now the United States of America. Models of the first steamship to cross the Atlantic and the first aircraft to make a sustained flight under its own power, as well as many other things that have played very important parts in the history of the world, particularly in the physical and intellectual advancement of our own country, were prominent among the exhibits.

The splendid exhibit of Graphic Arts in addition to its educational significance, possessed attractive elements of much beauty, while the Astrophysical Division explained by instruments and charts the mysteries of the sun in its radiation of heat and the possibility of long range weather forecasts.

Exhibits of the Smithsonian Institution

at the

Sesquicentennial Exposition

1926

Introduction

The Smithsonian Institution was created by act of Congress in 1846 under the terms of the will of James Smithson, an Englishman for whom the Institution is named. Its function is the "increase and diffusion of knowledge among men."

The exhibits of the Smithsonian Institution were from the Bureaus of the National Museum and the Astrophysical Observatory—the first named included Anthropological material, Geology, Biology, Mechanical Technology, Graphic Arts and Photography, and History.

Description of the Exhibits

The arrangement of the exhibit was designed to give a harmonious grouping of the whole as well as to bring related objects together, forming a unit of both artistic and instructive value. Following out this idea the large cases were placed centrally or at the sides, and the smaller cases, intended for close examination, spaced about the larger cases, thus allowing an unobstructed view of the groups from the broad aisles of the exhibit building. Bringing the related cases together in this manner aided the visitor in examining the exhibit. Thus next to the copper mining group were placed the cases containing objects of worked copper illustrating the aboriginal industry, and close by the cases of ancient pottery a group of Indians was making pottery by the ancient methods.

Everything exhibited was well labeled, the facts concerning a group of objects presented in a case-label, and the individual specimens having a label giving the data required. These labels contained only the most important facts as a matter of the economy of the visitor's time and energy.

Especial interest attaches to the series of objects showing the development of inventions. Here was presented a novel and efficient method of teaching by means of a progression of related facts.

The large groups, designed by Dr. W. H. Holmes, also offered an immediate and lasting appreciation of history, that is, the appearance of the native Indians, a view of them at work at their characteristic

crafts, and a suggestion of their immediate surroundings. The village groups portrayed the habitations, aggregation of houses into villages, the surroundings, and outdoor occupations, and showed a method of presentation in a small space of a great number of scientific and historical facts.

Anthropology

Ethnology, that branch of anthropology dealing with the material culture of the races of men, had a preponderating number of exhibits in the space assigned to the Smithsonian Institution. They were arranged in three series, each forming a unit within itself though blending into the general idea which the division exhibit was intended to present. Interesting phases in the daily life, and examples of the arts and crafts of the native Americans were presented. Developmental series of objects such as implements, weapons, and articles constantly used by primitive peoples in food gathering in domestic service, in warfare, and for executing their art impulses, afforded what was essentially an objective study in the history of inventions. This series was continued up to and inclusive of the historic period in so much as pertained to the large group cases which showed native American weavers, potters, and silversmiths at work. Wherever possible objects showing progressive stages in early invention were selected from among those in use by American Indian and Eskimo tribes rather than by primitive groups from other parts of the world, although in some instances it became necessary to include, for the sake of a proper sequence in the progressive development of a craft, objects of primitive material culture from tribes outside America.

The *first* of the three series of exhibits mentioned included eight models in miniature of village groups of the Iroquois, Sioux, Pawnee, Wichita, Chippewa, Seminole, Navajo, and Pujunan Indians. These gave an impression of the houses and outdoor life of the more important divisions of the historic Indians. The models were executed in plaster.

The *second* series consisted of objects placed in order to show the way things connected with daily life grew from simple beginnings. Objects selected from various localities but each having been actually shaped and used by the Indian or some other primitive people in their arts and crafts, showed the steps by which the primitive tools and implements have been developed through invention. These synoptic series were easily understood and pointed to a novel and valuable method of instruction.

The series at the Sesquicentennial were named: the history of fire making; the lamp; the candle; the cup; the knife, fork, and spoon; the hammer; the saw; the drill; the American ax; the European ax; the

tobacco pipe; the jackknife; the adz; the scraper; the harpoon barb and toggle harpoon; fishhooks and sinkers; the spindle; the shuttle and the loom; and reduction and manufacture in metal working.

The *third* series of the division's exhibits comprised three large glass enclosed cases showing the arts and crafts of certain selected existing Indian tribes. The method of presentation was through plaster models of Zuni potters at work in fashioning and decorating their wares; Navajo silversmiths engaged in their trade; and Navajo weavers engaged in making their well-known blankets.

In the *first* series of the division's exhibits, that of the native American villages, representative Indian tribal groups were selected as typifying various culture areas of prehistoric North America such as they were at the time of the first contact with the Europeans. A comprehensive view of their environment, daily social and economic life, together with their various arts and crafts were obtained by close observation of the plaster models. Miniature houses and other structures are made from the same material used by the tribes in their native environment. Individuals engaged as in actual life at their various occupations and diversions were shown. Plaster figures and models were made true to scale wherever possible.

In the *third* series of the division's exhibit the plaster models of Indian artisans at work are life size. The Zuni Indian women making pottery; the Navajo Indian blanket weavers; and the Navajo Indian silversmiths engaged in making silver ornaments are typical of tribal crafts of the Indian tribes of the southwestern United States.

The Navajo women weave excellent blankets, rugs, and belts on hand looms, using wool derived from their numerous flocks of sheep. The Navajo blanket has become well known on account of the striking native designs in color with which it is decorated as well as for its durability in service. Their sale brings to the tribe thousands of dollars yearly.

The Navajo were taught a rude sort of metal working by the Spanish conquerors, and they have become very adept in the use of their primitive tools and apparatus. Much metal is wasted in the operation. It is brought into final shape by hammering, punching, chasing, and engraving. The objects made are mainly personal ornaments such as buttons, ear ornaments, beads, and bracelets; examples were placed with the figures.

American Archeology.—That branch of anthropology which deals with the material culture of peoples of the ancient past, was represented in some of its American aspects by an attractive exhibit which is explained as follows:

The cultured condition of man in the Western Hemisphere and more especially within the present boundaries of the United States, before the advent of Europeans, was represented by the small exhibit prepared by the division of American archeology.

The general character of native stone implements throughout the entire United States, from earliest time until the historic period, is illustrated in the exhibit by the series from Piney Branch Quarry, within three miles of the White House, Washington, D. C. This particular series shows the process of blade manufacture, from the unworked boulders obtained at the quarry site, through various evolutionary stages in the chipping process to finished objects, represented by arrowheads, spear points, and knives. In the District of Columbia and, indeed, throughout the entire Potomac-Chesapeake tide-water, the most serviceable minerals for aboriginal use was quartzite; elsewhere in the United States chert flint, obsidian, etc., were employed. The North American Indians possessed no iron, bronze, or similar smelted metals before the arrival of Europeans. Some tribes, however, did employ native copper.

Within the present United States copper was mined by Indian workmen chiefly in the Lake Superior district. The native method of mining copper, namely, by first heating the matrix and then breaking away the stone by throwing cold water on it, was illustrated in the National Museum exhibit by a life-size lay figure group. The North American aborigines had no knowledge of the smelting processes; they knew no means of hardening metals. With stone hammers they pounded into desired shapes such nodules of pure copper as they obtained through mining operations. Near the source of supply the relative abundance of copper decreased its value, even in native eyes. In consequence, knives, spears, and even agricultural implements were fashioned for daily use; examples of these, in addition to objects of personal adornment, have been discovered at old Indian camp sites and representative forms were shown in a case near the mining group.

These native Americans, who were still using stone-tipped arrows when Captain John Smith explored Chesapeake Bay in 1608, employed culinary vessels made of clay. Not every tribe made pottery, but those that did soon developed a tribal technique and characteristic type of earthenware decoration that serves, in general, to identify the handiwork of each separate people, at a given stage in their development. Thus the trained archeologist is enabled, through study of such antiquities, to recover much of the history of the prehistoric peoples. The types of pottery utilized by the Mound Builders and approximately contemporaneous tribes of the Mississippi Valley; the wares peculiar to

PLATE 246.—Exhibit of Department of Anthropology—in foregrounnd are shown a series of plaster life casts of prominent American Indians—to left exhibit showing Navajo Indian blanket weavers, and to right a case illustrating early steps in the invention of the hammer and drill.

limited areas in the ancient Pueblo region of the Southwest, were each illustrated by archeological specimens from the national collections.

The Inca peoples of Peru had at their disposal both cotton and wool—cotton from native plants; wool from the domesticated vicuna. With these two materials, fabrics illustrating nearly every weave known to modern mills were produced on the simple hand looms of the Indians. Gauze-like cloth, brocades and tapestries, sometimes plain and again bearing elaborate geometric designs and conventionalized figures, have been recovered from pre-Columbian tombs. The skill represented in these prehistoric Peruvian textiles was not equaled by any other people of antiquity, except, perhaps, by the ancient Egyptians. Not only did the Incas weave garments of wool and cotton, but they also wove slings whose average length is about nine feet. The Spanish chronicles of 1527 and following, furnish sample record of the skill of Inca warriors when using the sling; broken skulls from Peruvian graves also evidence the markmanship of these mountain tribes in their local, intertribal warfare. Examples of such slings, together with garments, belts, and bags—all from prehistoric Peruvian graves—were shown in the National Museum exhibit.

The Tuxtla Statuette, in the National Museum at Washington, is the oldest dated antiquity yet recovered in the New World. A replica of this historic treasure formed part of the Museum's Sesquicentennial display. The original was found near San Andres Tuxtla, in the state of Vera Cruz, Mexico, in 1902. It is made of jadeite and represents the figure of a bird-like deity with human head. The front and sides are inscribed with Mayan hieroglyphics which place it as a product of some branch of the great Maya race of Central America and southern Mexico that developed the most brilliant aboriginal civilization of ancient America. Its paramount importance lies in the fact that the date expressed by the column of bars and dots down the front corresponds to B. C. 98, which makes it the earliest dated archeological specimen in the Americas.

Physical Anthropology.—Embraces the study of man himself, his origin, division into races, depending upon physical characteristics which may be compared. The exhibit consisted of two cases containing busts of prominent Indians from several well known tribes and one case of life masks of the Eskimo.

The Indian busts in this exhibit are of special scientific value, being on one hand the best casts ever made of the American Indian, and on the other hand because they include a series of historically prominent Indian men, nearly all of whom are now deceased. (Plate 246).

The purpose of the exhibit is to show the Indian as he truly is. The purpose of the casts themselves is to preserve in a far more per-

fect way than can be done through photograph or by any other means the features of the full-blood American aborigines. The full-bloods are rapidly disappearing, and where not disappearing their features are being altered through their new mode of life.

These exhibits are also of certain economic importance, furnishing the most reliable documents to illustrators, artists, and sculptors.

Geology

The Geological exhibits were designed wholly with the aim of informing the public as to the character of the educational work now being carried on. They consisted of the several independent series of minerals, rocks, and fossils enumerated and described below:

One case contained a selected series of North American minerals used as gems for personal adornment, or for small objects of art; diamonds and other rare stones produced but on a limited scale were omitted. An especial effort was made to illustrate the utilization of comparatively inexpensive material which may be used locally as souvenirs. The following minerals and varieties were represented:

Amazonatone
Beryl, varieties acquamarine, (blue green) emerald, (green) and pink.
Chalcedony in its many varieties such as agate, moss agate, silicified wood, jasper.
Chrysoprase (a variety of quartz)
Chrysolite (peridot)
Corundum (sapphire)
Garnet
Jet
Lapis Lazuli
Malachite
Obsidian
Opal
Quartz (amethyst, rock crystal, rose and smoky)
Rhodonite
Serpentine
Sodalite
Spodumene (Kunzite)
Staurolite
Thomsonite
Tourmaline
Turquoise
Variscite
Vesuvianite (Californite)

A collection of all known radium producing ores and numerous radioactive minerals not utilized as ores included the following:

Carnotite, a yellow pigment consisting of calcium and barium compounds, intimately mixed, with amorphous silicates containing uranium and vanadium. This is the common ore of radium in the United States, occurring chiefly in Colorado.

Uraninite, or pitchblende from Joachimsthal, Bohemia, the common European ore of radium. It was from ore of this type that radium was first extracted by Madame Curie. Examples of

uraninite from American and English localities are also shown in the exhibit.

A series of the more recently discovered radium ores from the Belgian Congo, Africa, at this time the chief source of supply for all radium produced.

The radio-active minerals shown are: belafite and ampangabeite from Madagascar; exuemite from New Mexico; thorite from Arendal, Norway; samarskite from North Carolina; gadolmite from Texas; and ellsworthite from Canada.

Supplementing the ores and minerals were a sample of a radium-bearing sulphate; a radium-bearing chloride, of historic interest in that it represents the first radium prepared from American ores; a cube of glass which shows the beautiful greenish yellow color given to ornamental glassware by the use of uranium compounds; radiographs of polycrase in which the original radio-active minerals are shown, together with photographs made in the ordinary way and those made by direct contact of the minerals with a photographic plate; and "Becquerel's Experiment" which shows (1) a photographic plate in a black paper envelope on which is placed a sample of uranium-potassium sulphate. The paper is opaque to daylight but is easily penetrated by the "rays." (2) A plate which has been exposed to the action of the radiations from the uranium salt for 48 hours, and then developed. A black spot called a "radiograph" appears under the point where the specimen tube lay.

A small collection illustrating the quantitative composition of the most important ores of the common metals including iron (magnetite, hematite and limonite), lead (galena), copper (chalcopyrite), zinc (sphalerite), and tin. Accompanying each example of ore were weighed blocks of the chief constituents showing the amount of each element contained in the pure mineral of the weight shown. Products showing the percentage composition of wulfenite and molybdenite were also included.

A collection consisting of six series of the more common and widespread rocks in their fresh and decomposed condition illustrating the phases of rock decomposition and the origin of soils. The collection exhibited is a sample of hundreds that have in past years been sent out to schools and colleges.

The exhibits in Invertebrate Paleontology and Paleobotany were designed partly to illustrate the beginning of life and its earliest known manifestation, two questions now much in the public mind, but mainly to show the origin of the coal beds, Pennsylvania's great natural resource. One case was devoted to fossil seaweeds, or calcareous

PLATE 247.—Carboniferous plants of Pennsylvania.

PLATE 248.—General view of Paleontological exhibit. Fossil remains of a giant fish and sea turtle are displayed on the wall.

PLATE 249.—General view of Smithsonian Institution exhibit. Rocky Mountain Sheep in center case.

algae from the Archeozoic and Proterozoic eras, illustrating this primitive plant life of over 500,000,000 years ago. In the somewhat younger rocks of the Applachian Valley are found fossil remains of very ancient life which is represented in another case by especially well preserved examples of Middle Cambrian ancestral crabs, crawfish, and related forms. In a third case, mounted in pyramidal form, are selected slabs of the hardened shale found just above and below the coal beds of Pennsylvania, preserving the various forms of plant life which contributed so much to the formation of the coal itself. These plant specimens are mainly the remains of giant seed ferns and club-mosses which, near the end of Paleozoic times, formed trees eighty or more feet in height. (Plate 247).

The division of Vertebrate Paleontology exhibited the following fossil specimens all from the Niobrara Chalk deposits of the Upper Cretaceous of Gove County, Kansas. (Plate 248).

A nearly complete skeleton of the giant fish (*Portheus molossus*) Cope, which measures 12 feet in length and is unique from the fact that its predacous habits are clearly indicated by the undigested skeleton of a smaller fish within the body cavity.

The skeleton of an extinct marine turtle (*Protostega gigas*) Cope, shown as it was found with the top shell (carapace) crushed down flat upon the lower shell (plastron).

The skeleton of a second specimen of the same species of marine turtle slightly larger than the one noted above.

The skeleton of an extinct swimming reptile, (*Platycarpus coryphaeus*) Cope, exhibited on a table case, showing the bones of the animal as they were found in the ground. All of the bones, especially the skull, were much flattened by the weight of the mass of sediments that once covered them. In life this animal was about sixteen feet long.

In addition pictorial restorations of "*Protostega*" and "*Platycarpus*" were exhibited with the specimens.

Biology

Owing to the short time available for the preparation of an exhibit, a single piece was selected which illustrated a typical American animal, demonstrated the high development that the art of taxidermy had reached in the National Museum, and at the same time served as a dominating decorative center of the Natural History exhibit. This piece consisted of a group representing a family of Rocky Mountain wild sheep or bighorn. (Plate 249). The group as finished represents an old ram perched on top of a high rock with three ewes in various attitudes lower down.

PLATE 250.—Exhibit showing the development of the steam engine.

PLATE 251.—Exhibit showing the development of the steam engine.

Mineral and Mechanical Technology

The Division of Mineral and Mechanical Technology of the United States National Museum presented by a series of models and exhibits showing the development of the use of steampower from its earliest application to its use in the latest form of transportation aeronautics.

Within the main case of this exhibit there was shown the evolution of the steam engine from the earliest idea for using steam to produce motion to the first steam engine of the modern type. (Plate 250). The first model shows Hero's aeolpile, described in a treatise written by Hero, of Alexandria, in 50 A. D.

The next step in this evolution was illustrated by an illuminated drawing of a fountain operated by steam pressure. This fountain was invented in 1615 by Solomon de Caus, who was an architect to the King of France.

The third step illustrated the work of Giovanni Branca, of Italy, who in 1629 invented the steam turbine. The model shows Branca's workshop, in which there is a brick hearth with a hemispherical boiler from which extends a right-angled pipe terminating near a paddle wheel. The force of the steam emerging from the pipe forced the paddle wheel to revolve.

As the next improvement of the steam engine was the utilization of atmospheric pressure, the next two models illustrated the weight of air. The first model (upright in the center of Plate 251) shows the simple barometer or air weighing device invented by Torricelli in 1643. The second model in the foreground illustrated an experiment conducted in 1654 before the German Court by Otto Von Guericke. He had prepared in Magdeburg two hemispheres the edges of which fitted exactly. When these were placed together and the space within exhausted of air, the pressure of the atmosphere on the outside being without a similar balancing force within, held the cups so tightly together that the strength of sixteen horses could not pull them apart. These and other similar experiments established the fact that air had weight and could be made to do work. This potentiality was soon utilized for improving the steam engine.

The next model shows the laboratory of Denis Papin who invented the safety valve piston in 1690. His invention of the safety valve occurred when he contrived a mechanism for preventing a pressure cooker from bursting. He filled a conical aperture in the lid of the cooker with a plug which was held in place by a weighted bar.

Adjacent to the Papin model is an illuminated drawing of a steam engine invented by an Englishman, Thomas Savery, which was used in the latter part of the 17th century for draining mines. The draw-

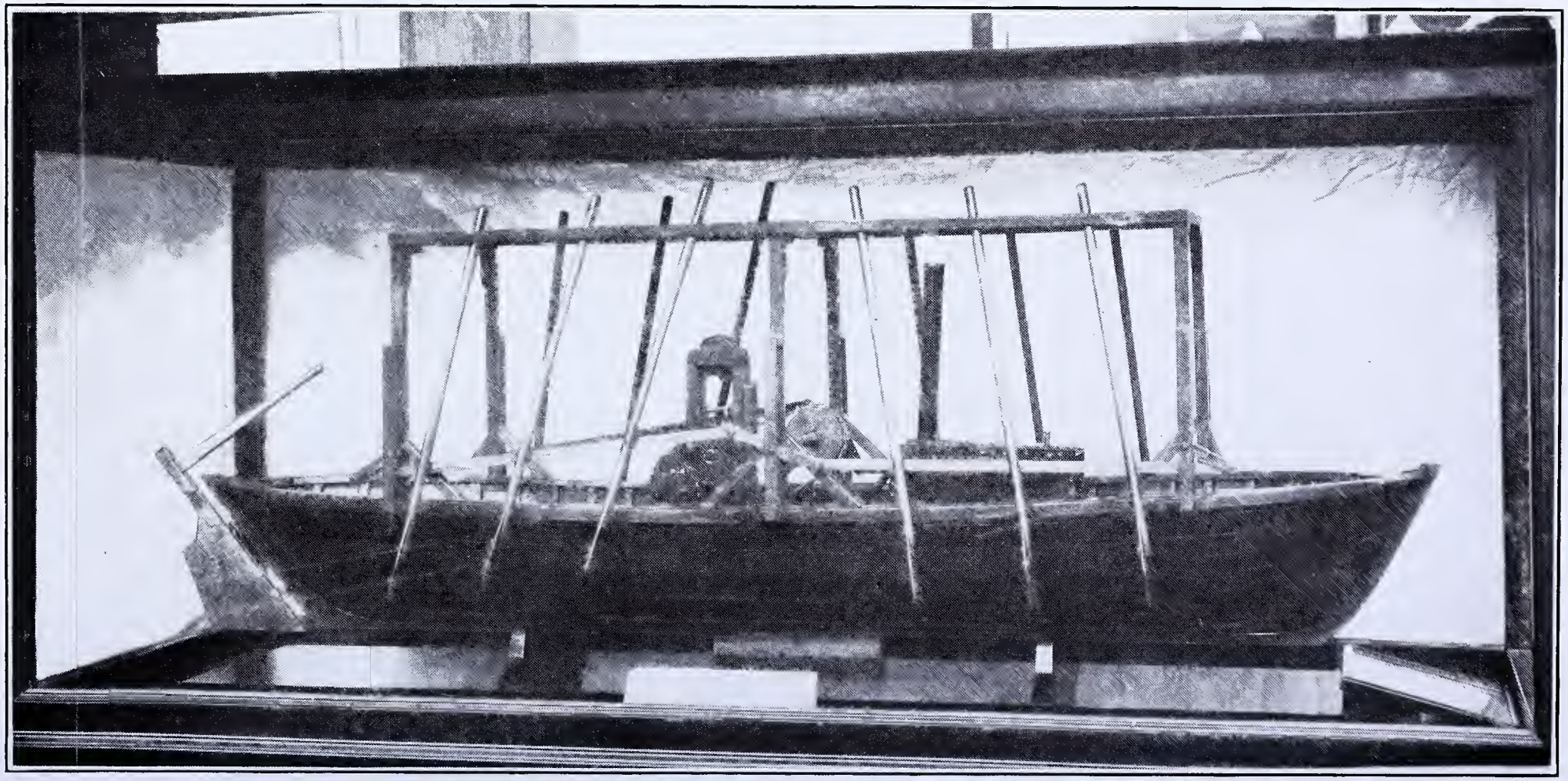

PLATE 252.—Model of John Fitch's steamboat. Used on Delaware River, 1786.

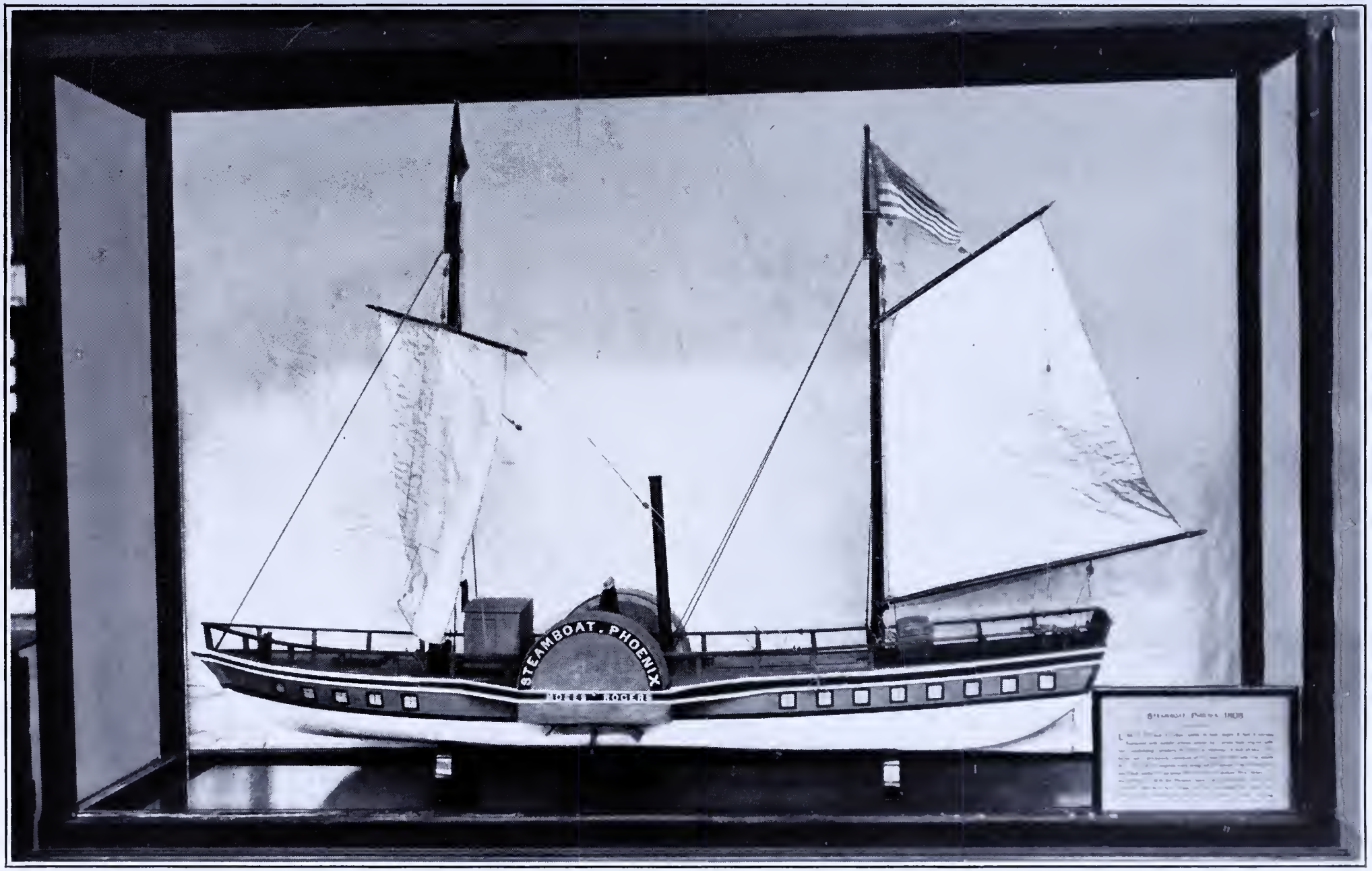

PLATE 253.—Model of Colonel John Stevens' steamboat "Phoenix," the first steamboat to navigate the ocean.

ing shows a boiler connected to an egg-shaped vessel which, in turn, is connected to a vertical stand-pipe furnished with valves. The stand-pipe was connected at the bottom to the source of drainage water which was to be removed from the mine and its upper end extended to the surface of the mine.

Next was a miniature reproduction of a Newcomen engine. Thomas Newcomen was an English blacksmith and engineer who had studied the efforts of his predecessors and incorporated in the steam engine, which bears his name, the salient features of preceding machines and many improvements of his own. The drawing shows one of his engines erected in England in 1717 and applied to drainage.

It was while working as an instrument maker and repairing a small Newcomen engine that James Watt obtained his first interest in steam engines and developed a type of his own which utilized steam alternately on each side of the piston, as is the case with modern steam engines. The central model of this group illustrates Watt's steam engine, "Old Bess," which was an improvement upon the Newcomen engine and was installed by him in the factory of his partner, Matthew Boulton, in 1777.

At the end of this case of models was an engraving of Watt with a description of his life and achievements. All of the models in the exhibit had descriptive labels and those which had movable parts were operable by the visitors.

Applications of the steam engine to the needs of mankind are numerous but an important use is for transportation. The exhibit included four important steps in the early development of steam water transportation. As was quite appropriate for an exposition at Philadelphia, the first of these four steps was a model of John Fitch's steamboat, (Plate 252), the first steam propelled vessel used on the Delaware River. It was constructed in 1786 and a public trial was made on July 27th of that year. Fitch's experiment was successful and a second boat was constructed two years later which was used for passenger service between Philadelphia and Burlington a distance of twenty miles.

Fitch's experiments were confined to small boats and never attained the importance which characterized the work of Robert Fulton whose *Clermont* was reproduced in miniature as the second of the series of boats exhibited. The *Clermont* was built in New York by Fulton and made its first trip from that city to Albany in August, 1807. It was commercially successful and was followed by other Fulton built boats, including the first double-ended ferry boat and the first steam-propelled warship. The third model exhibited, (Plate 253), was of the *Phoenix*, the first steamboat to sail upon the ocean. The *Phoenix* was built under the supervision of Colonel John Stevens, a

PLATE 251.—Model of steamboat "Savannah," the first steamboat to cross the Atlantic Ocean. Sailed from Savannah to Liverpool in summer of 1819.

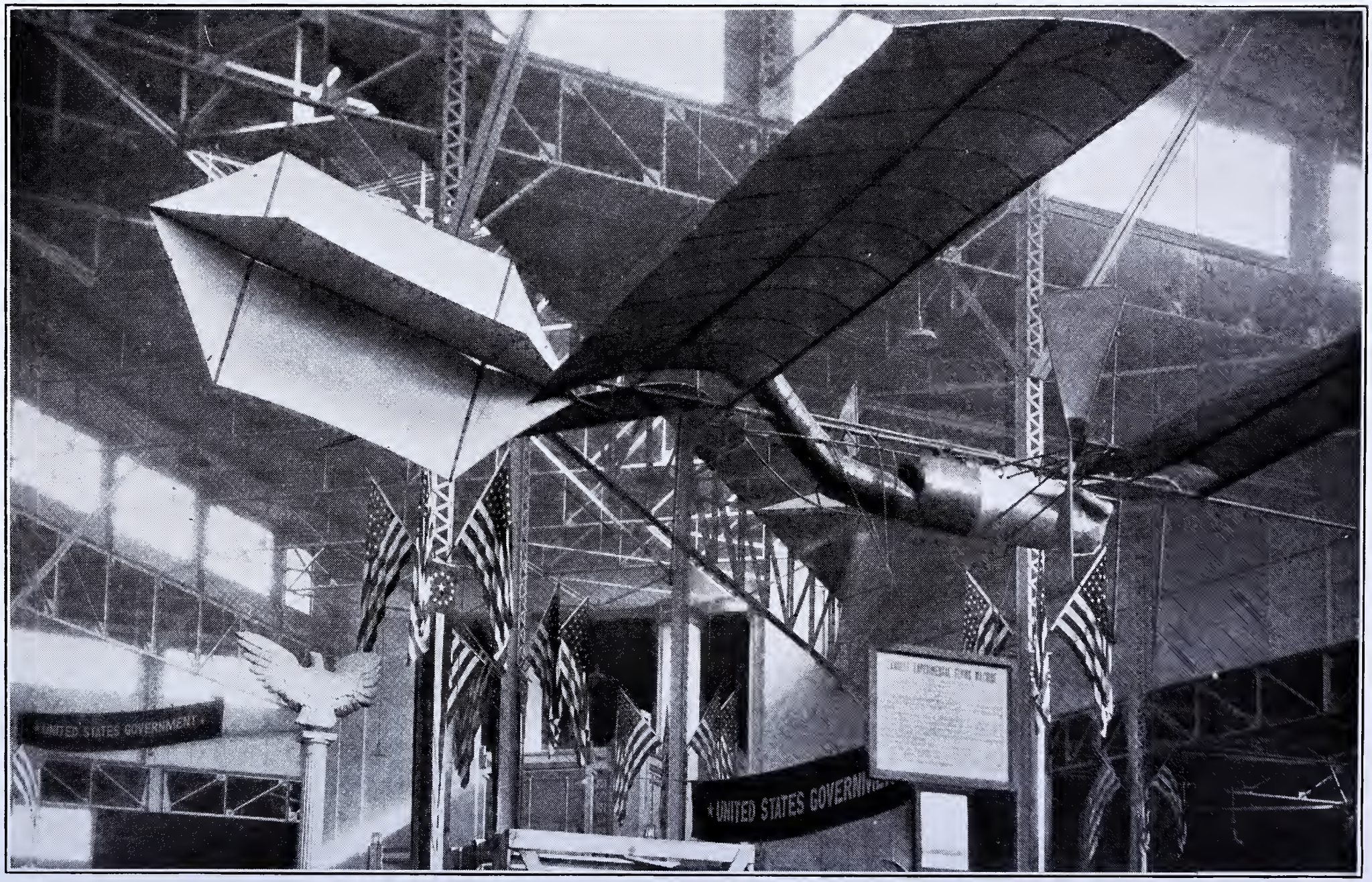

PLATE 255.—Side view of copy of "Langley Aerodrome No. 5," the front of the aircraft being at the right.

noted steam pioneer, and made its famous voyage, from Sandy Hook to Cape May, New Jersey, in the summer of 1808. After reaching Philadelphia it ran as a Delaware packet for a number of years until wrecked at Trenton, New Jersey, in 1814. The fourth model of this series, (Plate 254), illustrates the *Savannah*, the first steamboat to cross the Atlantic Ocean. The original ship was built by Francis Fickett at Corlears Hook, New York, and was launched August 22, 1818. Although originally designed as a sailing ship, she was fitted with a steam engine made by Stephen Vail, and on May 22, 1819, she sailed from Savannah, Georgia, arriving at Liverpool on June 20. When nearing the British coast she was chased all day by a revenue cutter which mistook her for a ship on fire. Subsequently she visited many of the principal ports of the world and returned to Savannah.

Adjacent to these boat models were exhibited bust of Robert Fulton and John Stevens who were intimately connected with the boats nearby.

Although everyone is familiar with the important part played by the steam engine in the progress of land transportation, few are acquainted with the fact that steam was frequently used by early aeronautical experimenters and was the power used by Professor S. P. Langley, of the Smithsonian Institution, in his aircraft which, on May 6, 1896, made the first power sustained flight in the history of the world. To illustrate this fact, a copy of the Langley aircraft was hung above the other steam exhibits, (Plate 255).

The variety of specimens exhibited, their excellent appearance and their educational importance combined to make a display which drew many visitors and excited many favorable comments.

Graphic Arts

The exhibits of graphic arts at the Sesquicentennial covered the subject of "Illustration" from the early drawings and woodcuts to the latest photo-mechanical processes. Each process was described both technically and historically in this exhibit. A history of photography was also included. The entire exhibit was arranged on screens and in flat top cases, with the exception of two historical motion picture machines, and made an attractive and pleasing unit. About two hundred and fifty specimens were shown, each one being carefully selected to tell its part in the whole. Forty-nine drawings, paintings and prints were framed and hung on the screens and to add a touch, busts of Franklin, Senefelder, DeVinne and Daguerre were placed on the ends of the two screens, these being men who did much for the development and encouragement of the graphic arts.

The first subject to be taken up was drawing, which includes painting. This was divided into seventeen different styles as follows:

Pen and ink on white paper
Pen and ink over preliminary pencilings with sepia washes
Pen and ink on enamel paper
Lithographic crayon on enamel paper
Line drawing with a brush
Lead pencil drawing
Crayon
Crayons and charcoal combined
Pastel
Water color (pure) on white paper
Water color (pure) on absorbent paper (Chinese)
Water color (pure) on pith paper (Chinese)
Water color (opaque) on grey paper
Water color on ivory (miniature)
Oil painting on canvas
Oil painting on copper
Oil painting on wood

These seventeen variations covered the principal methods of the making of illustrations by hand, and in most cases were fine examples of the art, some, being the work of old masters, were rare and valuable, and were of artictic as well as technical value.

With the exception of the photographic exhibits, the remaining specimens dealt more with the technical side of the principal methods of duplicating prints, and were arranged as follows:

RELIEF PRINTS

Wood Cuts

Tools and 16th century engraved blocks
Black and white prints
Prints in colors
Modern prints in color
Japanese method of making color prints

Wood Engraving

Blocks and tools
Examples of the work of Thomas Bewick who invented the process
Prints by Alexander Anderson, who was the first American to use the method extensively
Work by Henry Wolf, and Timothy Cole, who have done the finest work

These specimens were of fine quality and extended over several centuries, showing the variation of the Oriental and European methods and the final development in the United States in the last fifty years. Each specimen had its own special label, telling of its relation to the whole and then each case had general labels giving a history of each process. Just to give an idea of them, the one on "Relief Printing" follows:

Relief Printing

The first duplication of engraved characters took place in China about 175 A. D. by means of rubbings, in the same way a rubbing is made from a coin. The Chinese were printing from engraved wood blocks as early as 593 A. D. Japan was using this method in 764 and Persia in 1293. The ink used is water color mixed with rice paste and it is painted on the block with a brush. The invention of paper had much to do with the development of the art of printing. European countries did not have paper until after the invasion of the Moors in the 12th century. The first duplication of designs in Europe was made by means of the stencil about 1390. A few years later prints from wood blocks were made with oil as the medium for the ink. The first print to bear a date was "The Brussels Virgin," 1418. In this early method the design is cut in outline, on planks of various kinds, such as pear or cherry, the wood between the lines being removed with knives and chisels. About 1770, Thomas Bewick, an Englishman, made engravings on boxwood cut across the grain. This method has been used by nearly every wood-engraver since that time. Dr. Alexander Anderson was the first American to use it extensively. A very distinguished American school was developed after 1870. It produced much work of high quality. Timothy Cole is one of the most accomplished and is still producing. At first the design was drawn on the block but after the perfection of photography, the design was printed on the wood and then engraved. After the perfection of the photo-mechanical processes, wood-engraving as a reproductive method has been in little demand.

In the last twenty-five years, the artists have taken up this method for original expression, using boxwood, planks of various kinds, or linoleum and printing in black and white or in colors, using water colors or printer's ink and much original work of decided artistic character has been produced.

Intaglio Printing

The second great class of printing is known as intaglio, that is, the print is actually produced from the grooves in the plate, which are

PLATE 256.—Exhibit of Intaglio Engraving and Etching.

filled with ink, the surface being wiped clean. (Plate 256). There are numerous ways of obtaining the intaglio plates and as shown in the exhibit were arranged as follows:

Engraving	Pure line
	Line, etching and engraving combined
	Steel, banknote
	Steel, transfer process
	Steel, pictorial
	Machine engraving and lathe work
	Stipple
	Mezzotint, in black and white and color
	Flick
Etching	Line
	Drypoint
	Aquatint, wet and dry methods
	Softground
	Prints in color
Miscellaneous	Baxter oil print
	Monotype

In line engraving on steel, the technical series was very complete, covering practically every step in the making of a process from the original to the finished print, together with all tools and materials. The others were treated technically also but not so completely.

The Baxter oil print is a combination of one intaglio plate with several wood block plates of wood, the latter printing the colors. The monotype is not an engraving process, but an oil painting on metal or other surface which has been transferred to paper by pressure. Its location here was because it is usually printed on an engraver's press.

Planographic Printing

The third great class of printing is called planographic or surface printing; in this there is neither relief or intaglio, but the plate is prepared in such a way that the printer's ink will take only where it is wanted. It is really a chemical process, based on the fact that grease and water do not mix. The design is worked up on a grained stone or metal and after the grease is set, prints can be made. This is the most recent process, being discovered by Alois Senefelder in 1798. Examples of the variations of this process were shown as follows:

PLATE 257.—Exhibit of pictorial photography.

Planographic	Pen and ink with two tints
	Crayon
	Crayon, hand colored
	Chromo
	Offset
	Photo-mechanical

In the last one hundred years photography has been perfected and has been adapted to all the engraving processes, so that at the present time nearly all the prints we see today are produced by some one of the photo-mechanical processes. The first print by these methods was made in 1826 but it was not until 1859 that a commercially successful method was developed. All of them are based on the fact that glue or similar substances sensitized with bichromate become insoluble when exposed to light. Intaglio, relief, and planographic prints were shown, both in black and white and in color. Also some rare historical prints. In this section of the exhibit were shown photo-mechanical prints made by the following processes:

Intaglio	Photogravure in black and white
	Photogravure with a screen
	Photogravure in colors
	Photogravure in line
	Rotary photogravure in black and white and in colors
Planographic	Collotypes in black and white and in colors
	Aquatones in black and white and in line
Relief	Halftones in black and white and in colors
	Print by Paul Pretsch, made about 1855
	Ives process 1885
	Progressive proofs

The object of the whole exhibit was to show how illustrations are made, so that it is possible to identify them. This knowledge is of great value to the publisher, the collector and the person interested in pictures. It is also of value to any one, who for example wishes to learn to make etchings, or any of the other processes. A similar, but more complete exhibit is in the United States National Museum at Washington.

Photography

The last of the series of exhibits was historical and pictorial photography. (Plate 257). This extended over exactly one hundred years, for Joseph Nicephore Niepce produced in France his first per-

PLATE 258.—General view of the exhibit of Graphic Arts, showing the "Woodville Latham" motion picture projector in the foreground. This machine was first used in 1895.

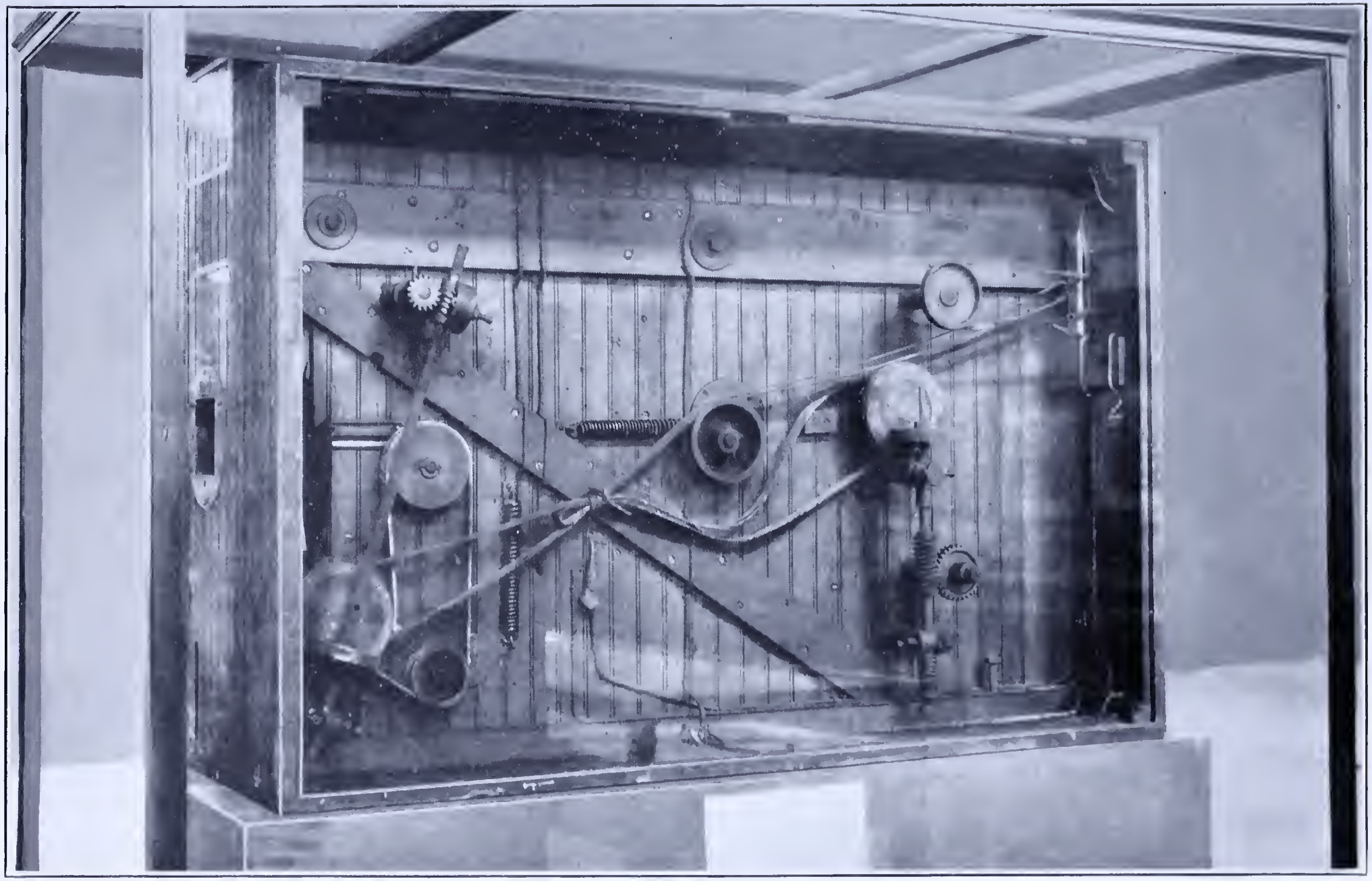

PLATE 259.—Interior arrangement of the "Mutoscope" motion picture projector, invented by Marvin and Castler about 1897.

manent picture with the aid of light in 1826. The action of light was known long before this but this is the first instance where it was made permanent. In 1839, Daguerre in partnership with the son of Niepce announced their process which is known as "Daguerreotype." The same year Fox Talbot announced his process of paper negatives and paper prints. Both of these were superseded by Frederick Scott Archer's wet plate process, which is still used by photo-engravers. Then followed the tintype, albumen and carbon prints, dryplates, printing on paper and the film, which made possible the great motion picture industry. Original prints of these early processes were included as well as photographs of early cameras and tools necessary in their production. Two motion picture projectors of decided historical interest were shown, both were large and clumsy. One was made in the spring of 1895 by Woodville Latham, who is credited with being the first to project motion pictures on a screen. (Plate 258). He used a machine exactly like the one owned by the United States National Museum. This particular projector was used at Norfolk and Richmond, Virginia, in the summer of 1895. The other machine was the invention of Marvin and Castler and was a few years later. (Plate 259).

Pictorial photography was represented by the work of eighteen pictorialists from the various countries of the world. The United States was represented by Rudolph Eickemeyer, H. A. Latimer, Alfred Stieglitz and Floyd Vail; England by Charles Job, Fred Judge, and H. P. Robinson; Scotland by J. Craig Annan; artists of other countries were J. H. Coatsworth of Egypt, Ortiz Echague of Spain, Monte Luke of Australia, Dr. Meyer of Austria, Leonard Misonne of Belgium, Richard Polak of Holland, Aage Remfeldt of Norway, Guido Rey of Italy and Max Rudolf of Switzerland completed the lists of artists whose work was shown. It was a little international show of artistic photography, which in a small way illustrated work that is being done throughout the world today.

The exhibit as a whole made a pleasing and artistic appearance and the information was carefully thought out and arranged so that the visitor could obtain what it had to impart with the least effort. It covered the principal processes of the graphic arts and photography, with beautiful and attractive examples of each method so that it was possible to see what has been accomplished and to a limited extent how it was done, which was the object of the Graphic Arts Exhibit.

History

The exhibit of the Division of History of the United States National Museum at the National Sesquicentennial Exposition consisted of three classes of materials, namely: Military, Naval and Philatelic.

PLATE 260.—Smithsonian Exhibit with Historical Section in the foreground.

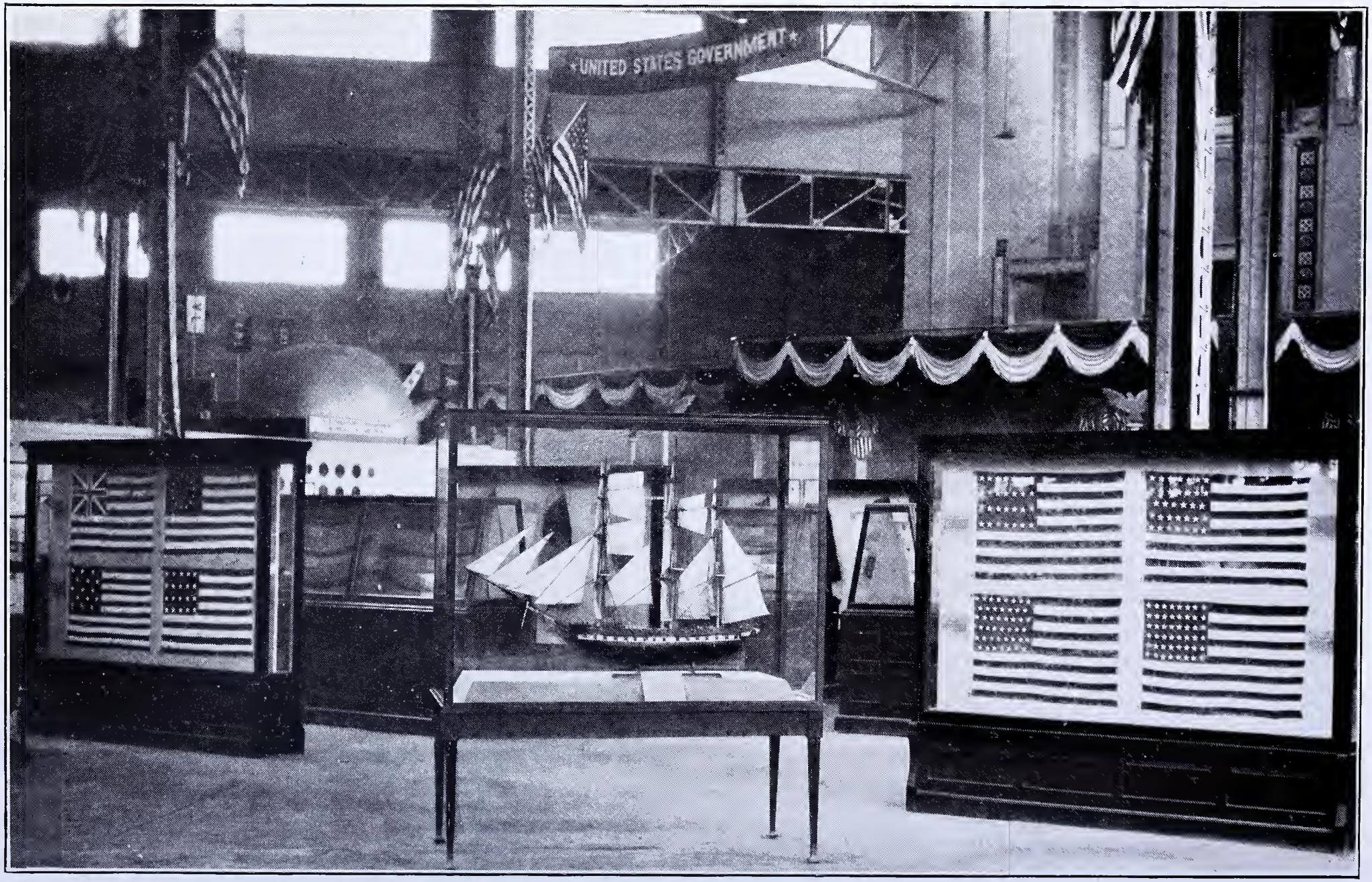

PLATE 261.—History Exhibit, showing flag cases and model of the "Constitution."

The military material formed the most important part of the historical exhibit and occupied about ninety-five per cent of the space allotted for this purpose. This material was contained in twelve screen cases, twelve slope top cases and one numismatic case of special design. The other cases were regular Museum cases of the types noted. (Plate 260).

United States National Flag

As an introductory feature of the military exhibit two screen cases on either side the main interior aisle were installed with eight *United States national flags*, the designs of which indicated the development of the national colors during the period 1776-1926. (Plate 261). The *first* of these flags represented the design of the Grand Union Flag which was flown over the Continental Army at Cambridge, Massachusetts, in January, 1776. This was the first distinctive American flag indicating the union of the Colonies. The design of the union which bore the crosses of St. George and St. Andrews represented the mother country to which the colonies at that time acknowledged a partial allegiance.

The *second* of these flags represented the First Stars and Stripes as established by Resolution of Continental Congress, June 14, 1777. The arrangement of the stars in the union was not prescribed by the resolution but the one shown seems to have been generally adopted. In some cases, however, a circle of twelve stars with a single star in the center was used instead of a circle of thirteen stars.

The *third* flag showed the design of the national colors as established by Act of Congress, approved January 13, 1794, and used during the War of 1812-15. The arrangement of the stars in the flags of this period varied in accordance with ideas of the makers. The arrangement shown accords with that of the stars in the original "Star Spangled Banner" which inspired the writing of the national anthem by Francis Scott Key during the British bombardment of Fort McHenry, Baltimore, in 1814, and which is now preserved in the United States National Museum.

The *fourth* flag showed the design of the national colors as established by Act of Congress, approved April 4, 1818, which provided that the number of stripes be reduced from fifteen to thirteen and that the stars should represent the number of states in the union. Each new star was to be added to the design of the flag on the Fourth of July succeeding the admission of the state thus represented.

The *fifth* flag showed the design of the national colors during the first year of the War with Mexico 1846-47. The number of stars in the union at that time was twenty-eight. The admission of Iowa, De-

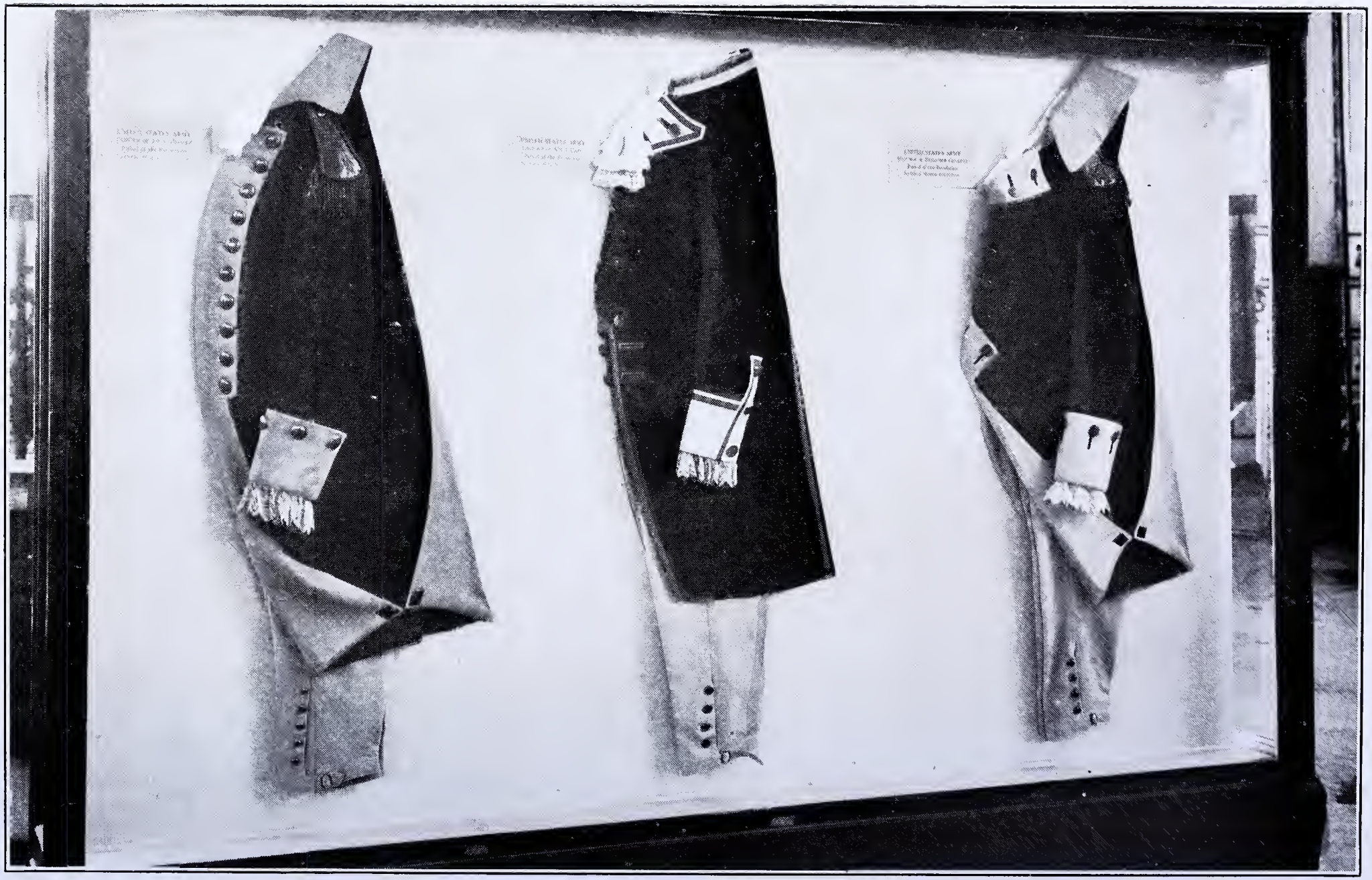

PLATE 262.—Uniforms of the Revolutionary War, 1775-1783.

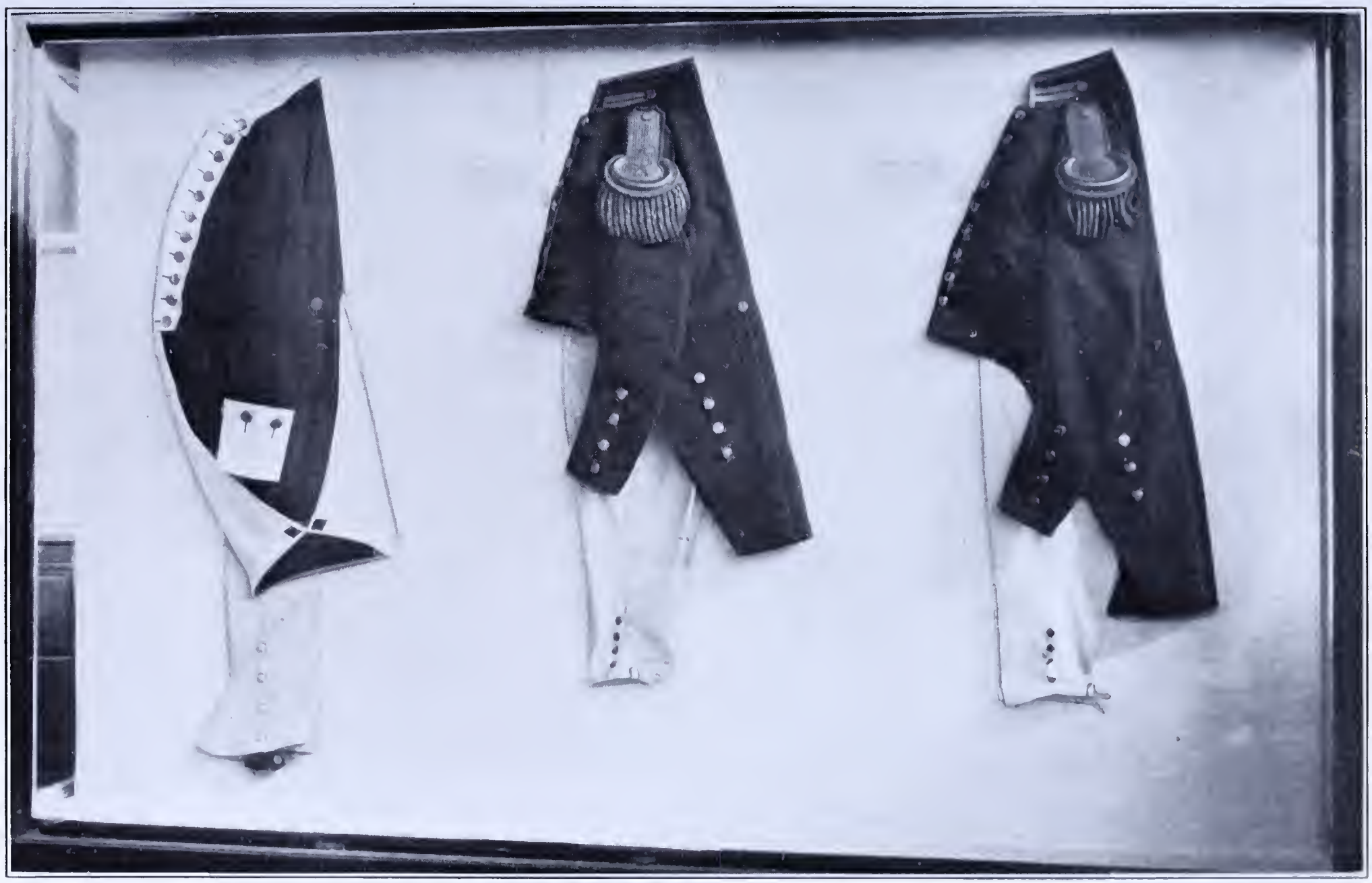

Plate 263.—Uniforms of War 1812-15.

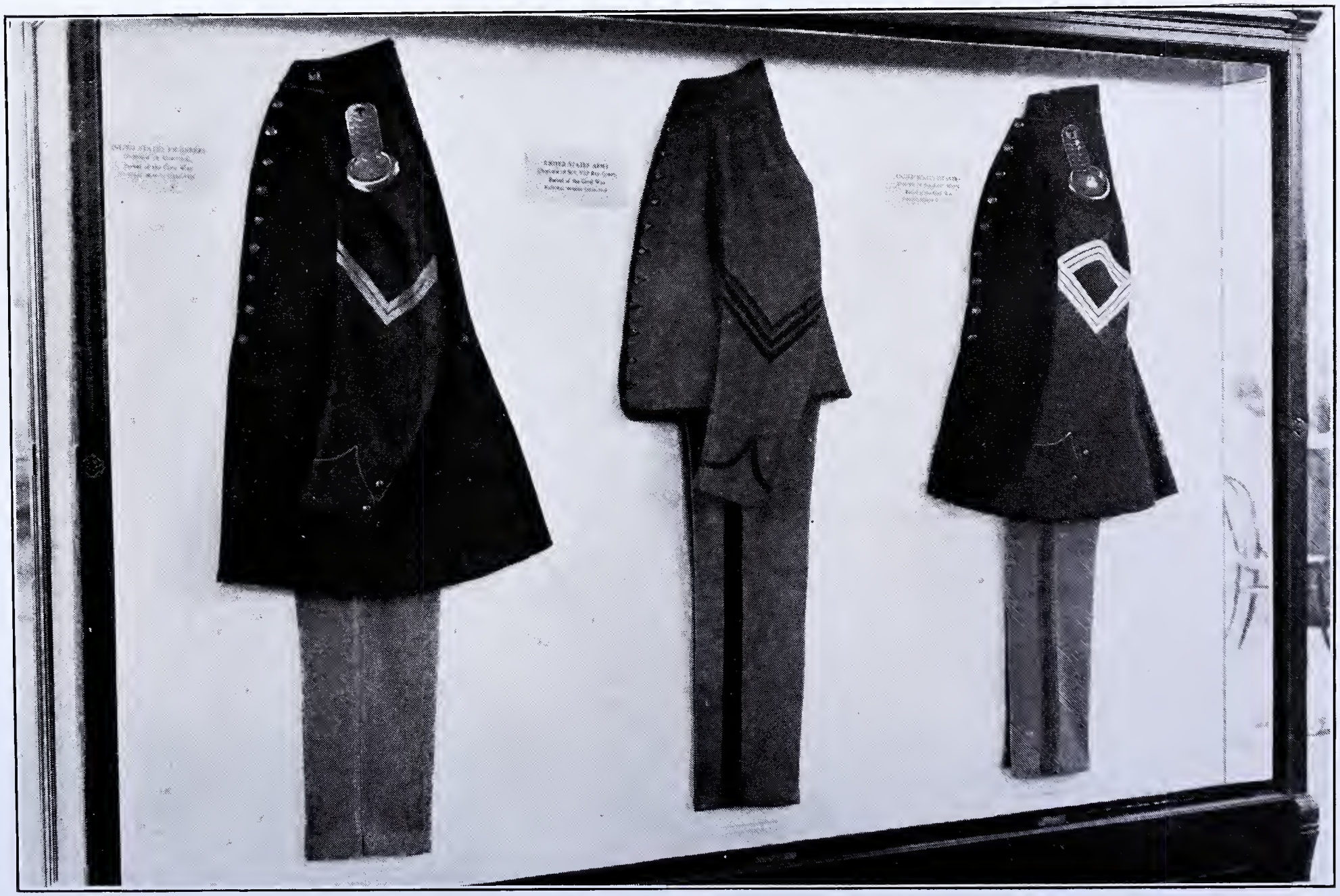

PLATE 264.—Uniforms of the Civil War, 1862-1865.

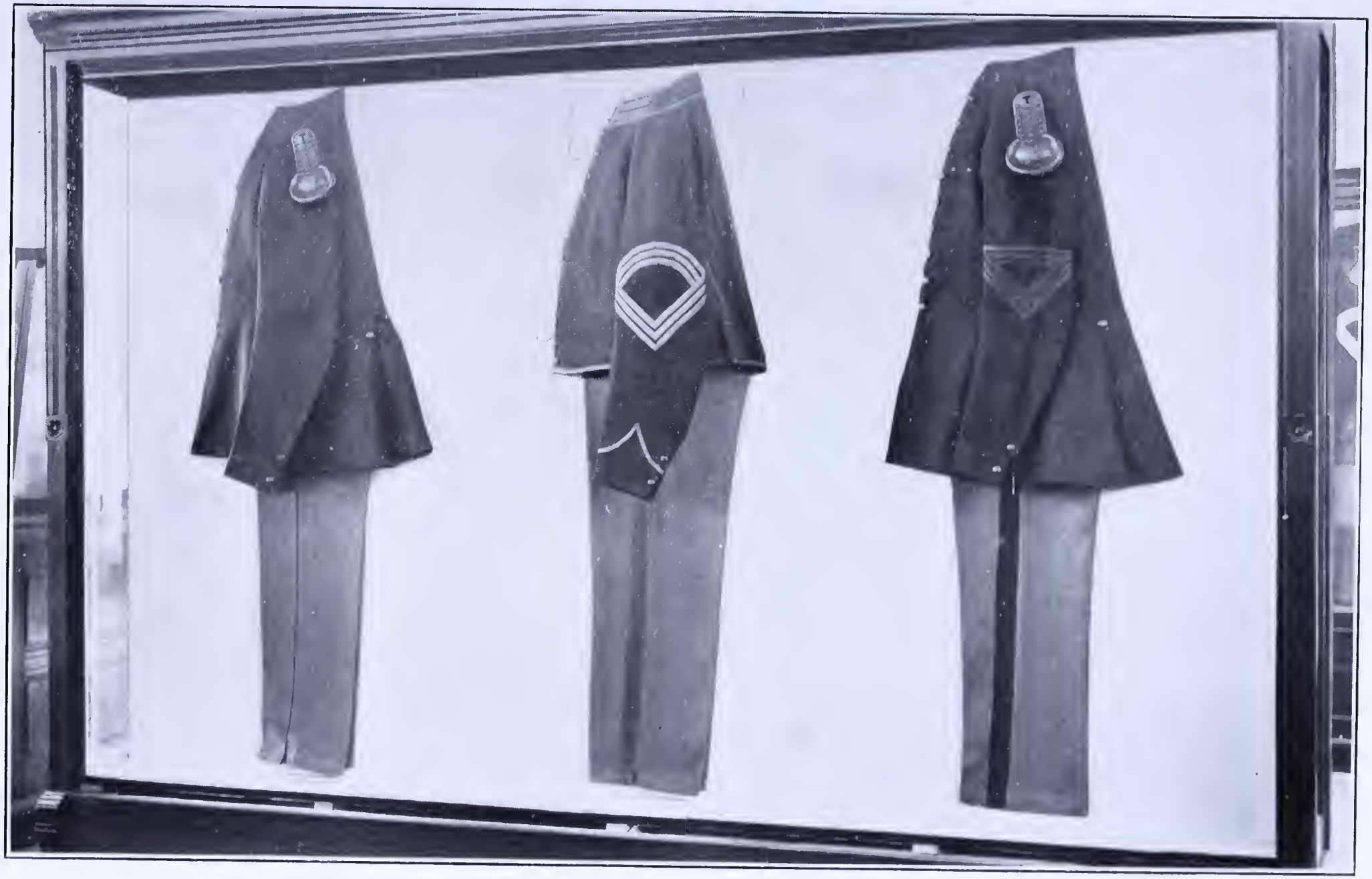

PLATE 265.—Uniforms of the Civil War, 1862-1865.

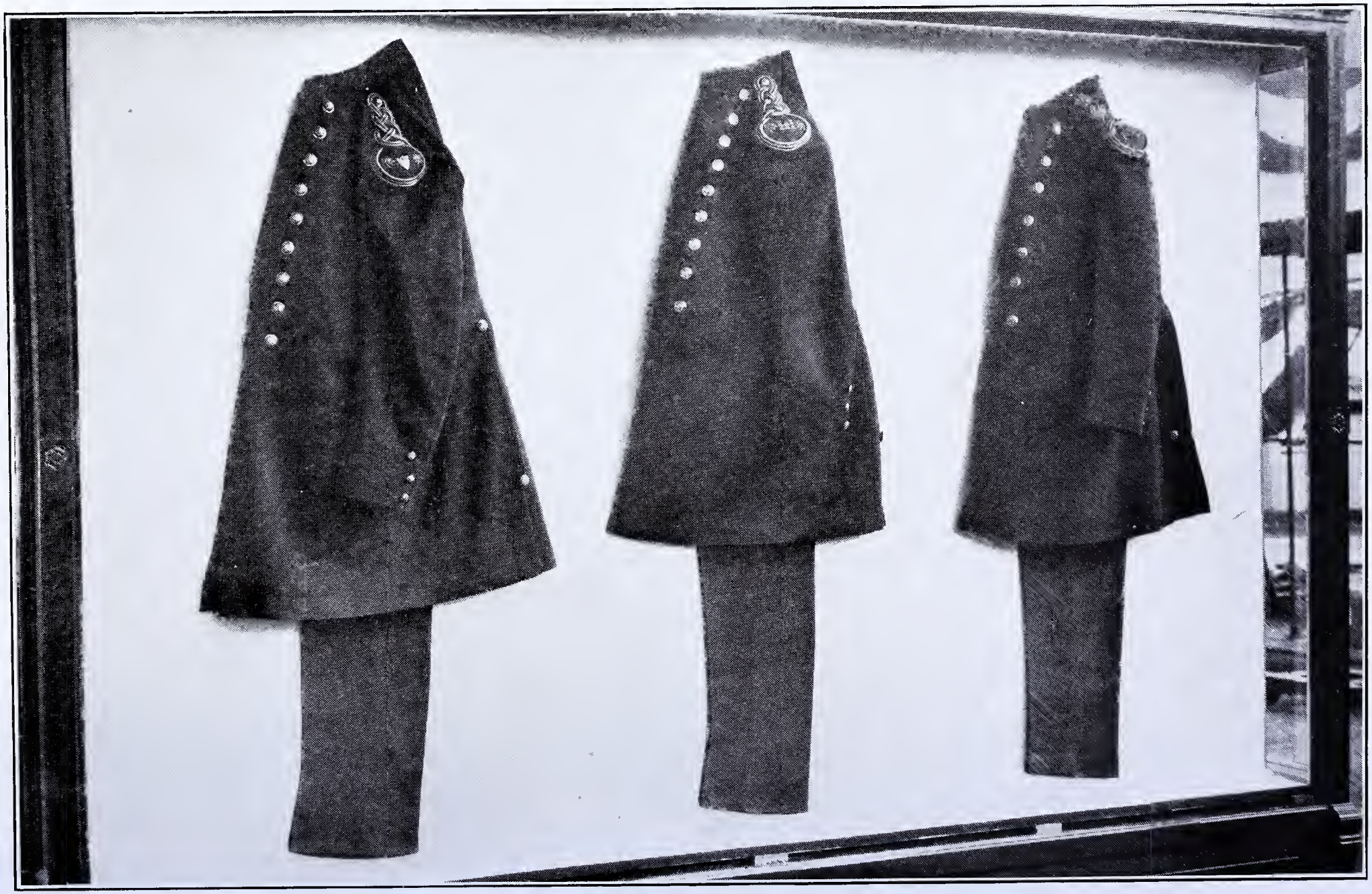

PLATE 266.—Uniforms, Spanish-American War, 1898.

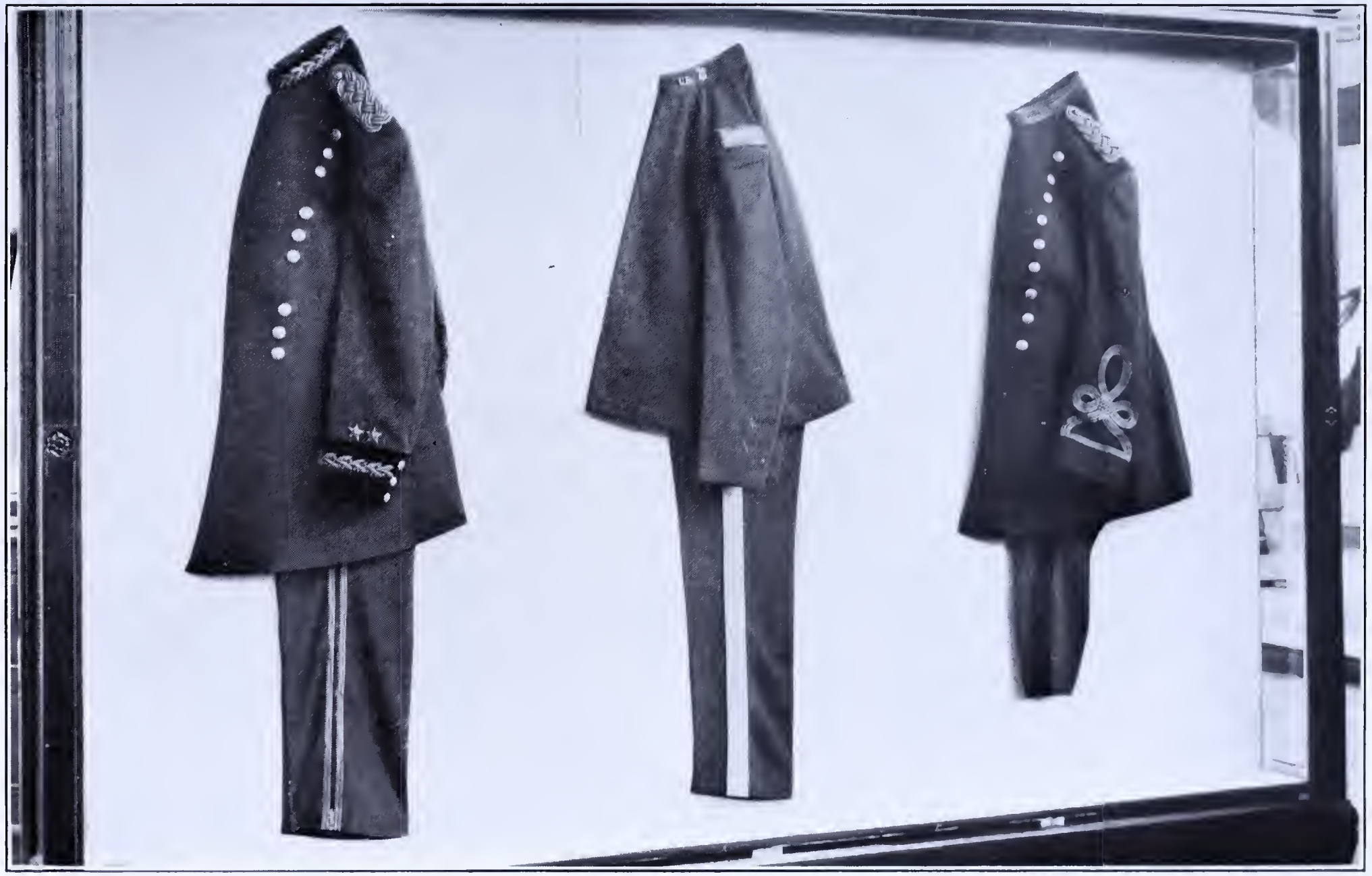

PLATE 267.—Uniforms, period 1908-1917.

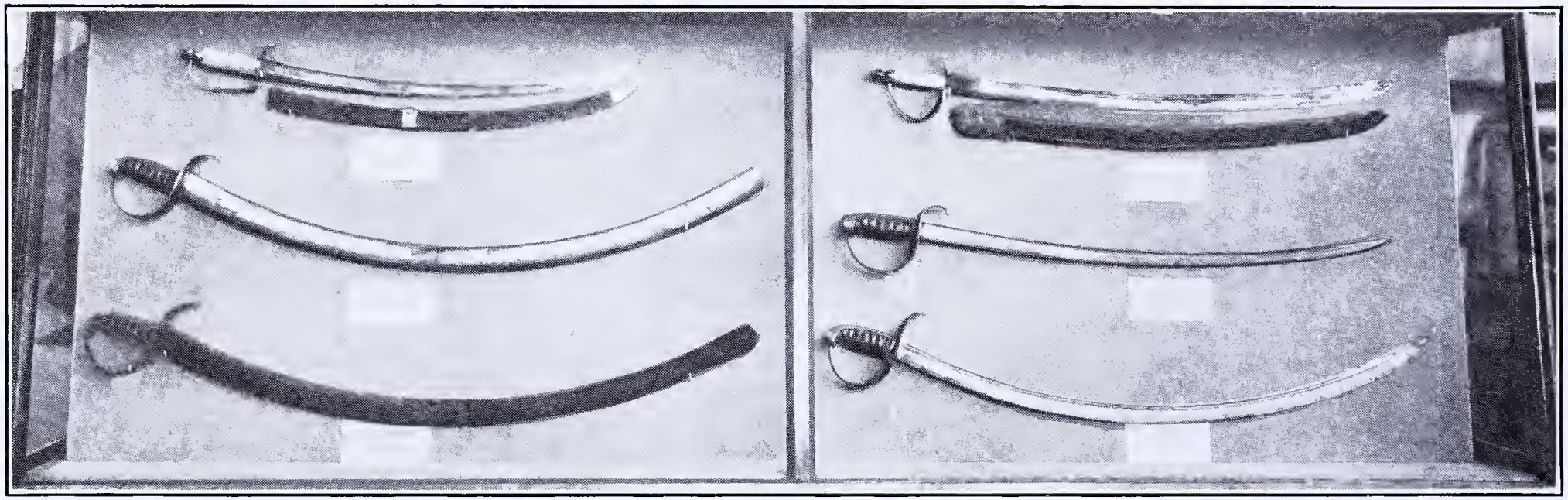

PLATE 268.—Swords of the Revolution.

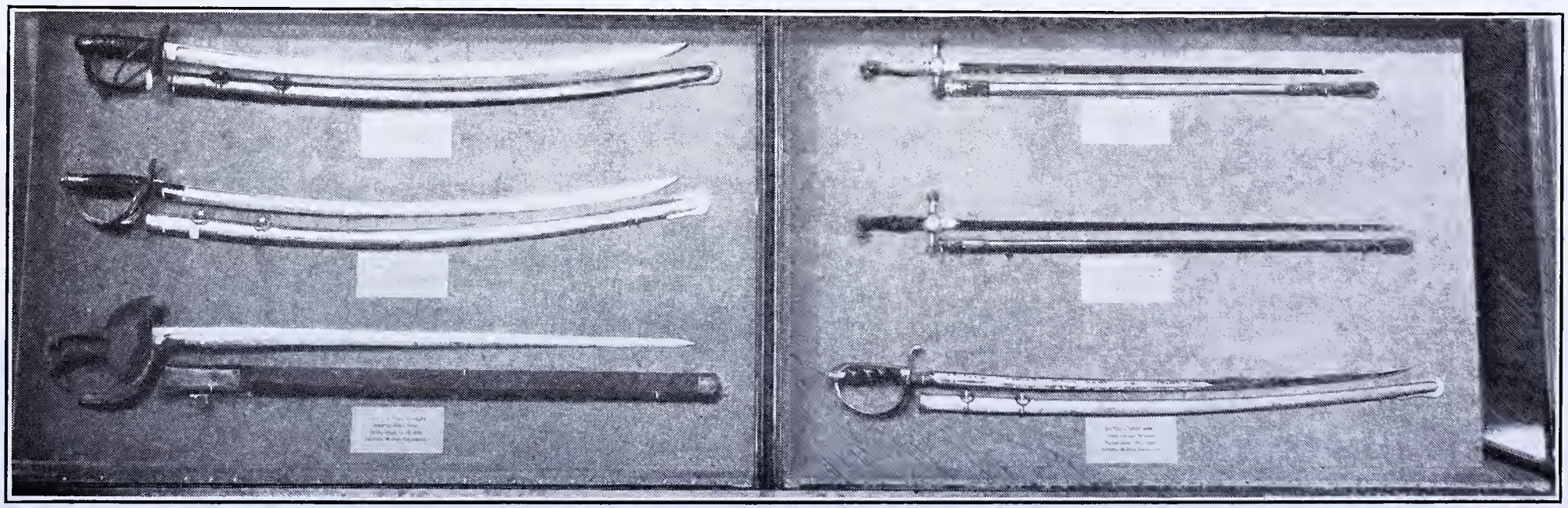

PLATE 269.—Swords, 1860-1926.

cember 28, 1846, increased this number after July 4, 1847, to twenty-nine. This was the number of stars in the union of the national flag when peace was made with Mexico in February, 1848.

The *sixth* flag showed the design of the national colors during the first two years of the Civil War, 1861-63. The number of stars in the union during that period was thirty-four. The admission of the State of West Virginia, June 19, 1863, increased this number after July 4, 1863, to thirty-five which was the number of stars in the union of the national flag when peace was concluded in April, 1865.

The *seventh* flag showed the design of the national colors during the War with Spain, 1898, when the number of stars in the union was forty-five. This remained the design of the national flag until July 4, 1908, when the number of stars was increased to forty-six through the admission of the State of Oklahoma during the preceding November.

The *eighth* flag showed the design of the national colors during the period of the World War, 1914-1918, when the number of stars in the union was forty-eight. This accords with the number of states in the Union 1912-1926.

Military Uniforms

Following the flag exhibit, twelve screen cases were arranged on either side of the central aisle and these were installed with a series of uniforms showing the types of such costumes worn by the officers and enlisted men of the United States Army during the following conflicts: War of the Revolution, 1775-1783; War of 1812-15; War with Mexico, 1846-48; Civil War, 1862-1865; Spanish-American War, 1898; and the period 1908 to 1917. (Plates 262, 263, 264, 265, 266 and 267). Uniforms of the type worn during the intervening periods of peace were also shown in their proper locations. The uniforms shown representing the period of the Revolution were reproductions but in the case of the remaining periods original uniforms were exhibited.

Military Swords

A special feature of the military exhibit was a series of swords installed in twelve slope top cases arranged alternately with screen cases and placed on either side the main aisle. This series of swords represented the types of weapons carried by officers and men of the various branches of the United States Army during the same periods as those described above in connection with the series of uniforms. (Plates 268 and 269).

From the time of the adoption of formal types of swords for the various branches of the Army about 1840, the series was very complete. It included examples of the three types of infantry sword of 1840 and

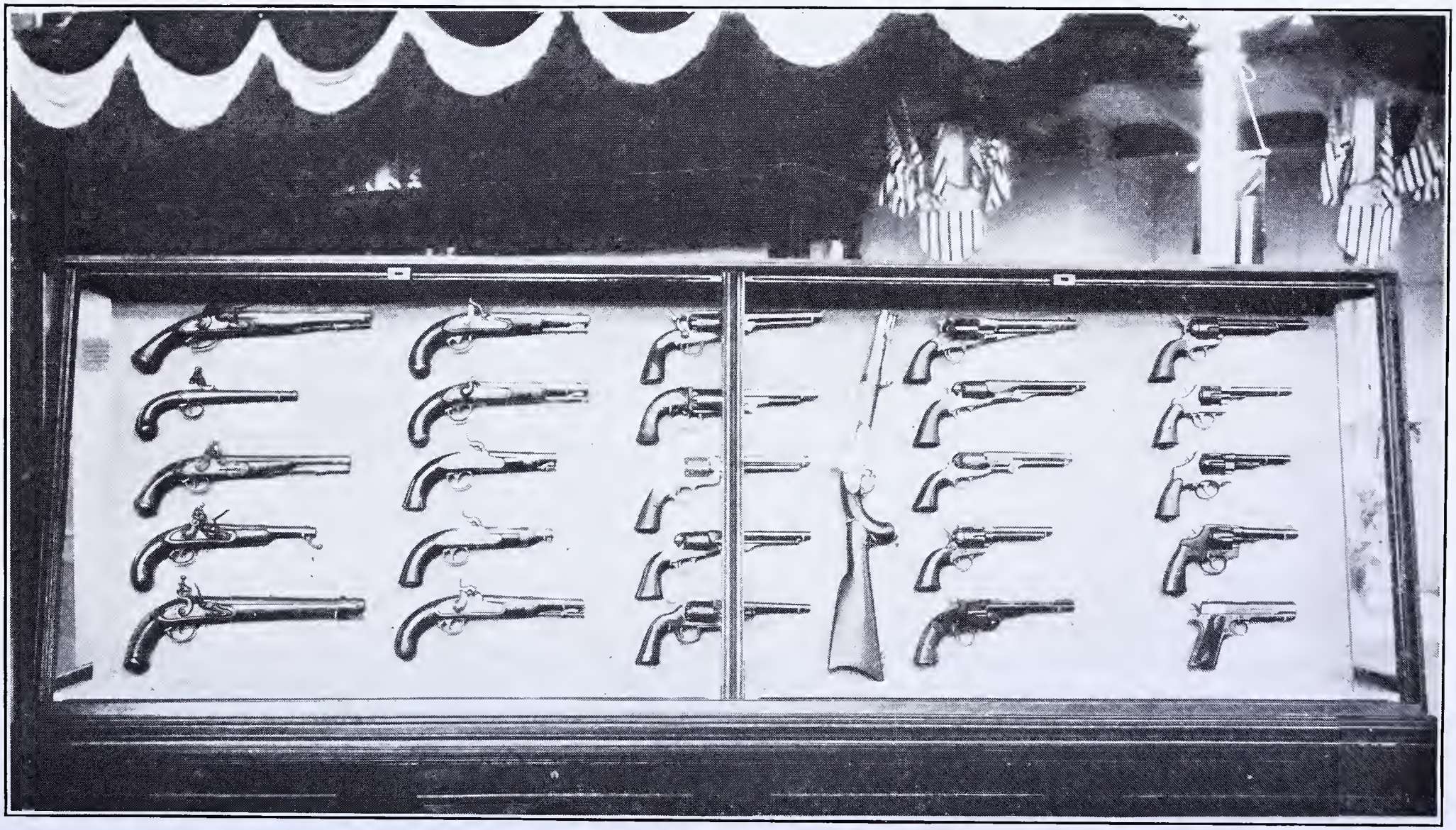

PLATE 270.—Pistols, 1776-1926. Pistol Carbine, 1855.

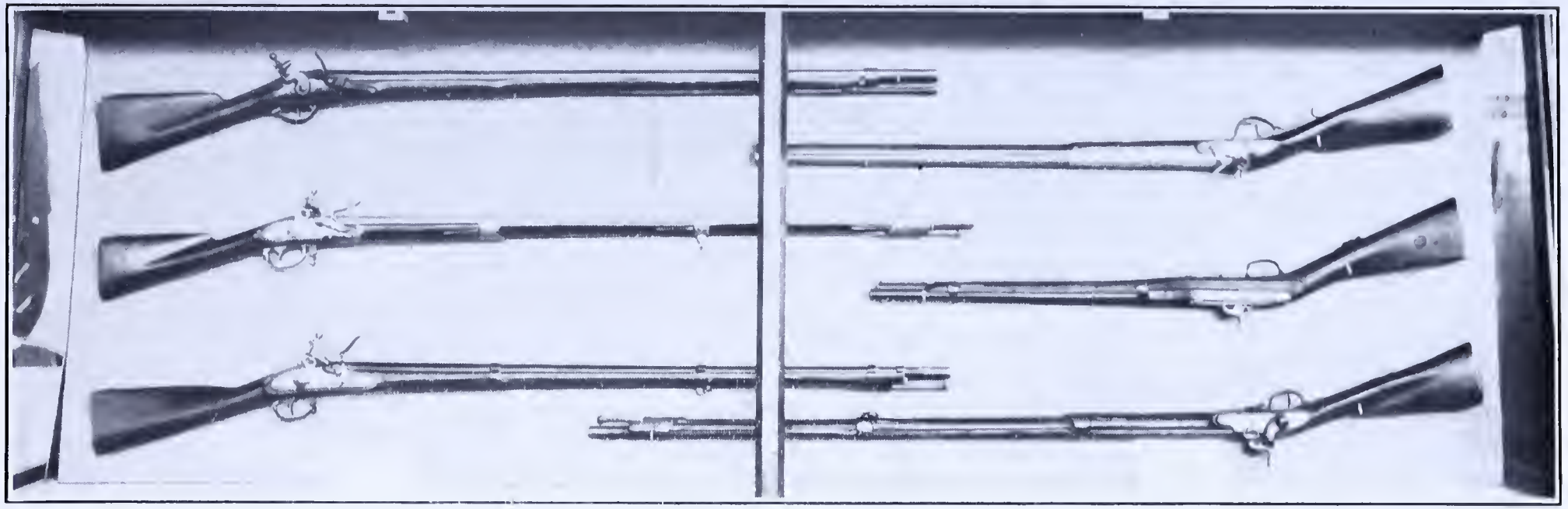

PLATE 271.—Rifles, 1776-1830.

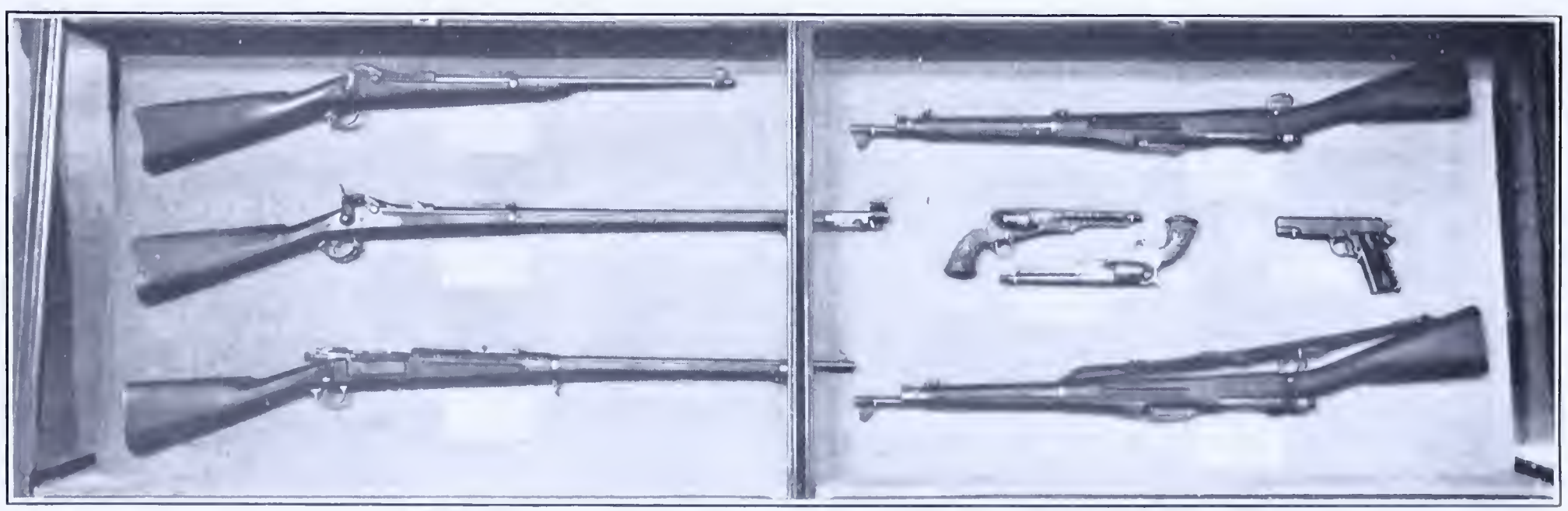

PLATE 272.—Rifles, 1884-1926. Pistols of the Revolution, Civil and World War periods.

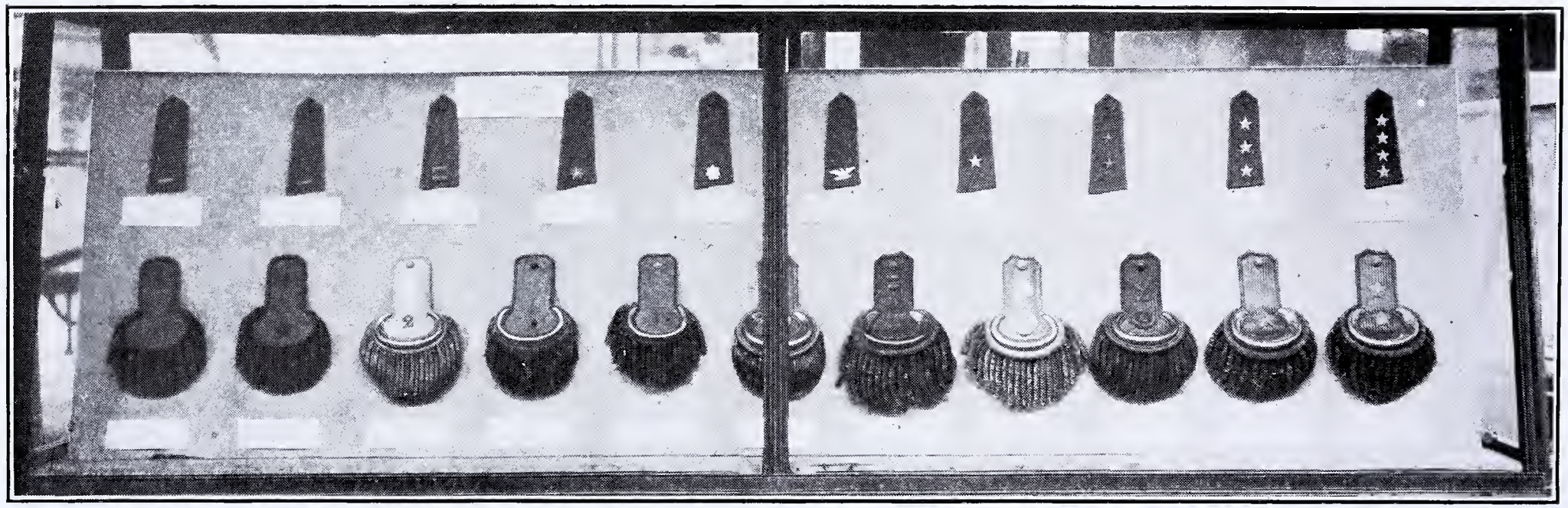

PLATE 273.—Shoulder Insignia, 1776-1926.

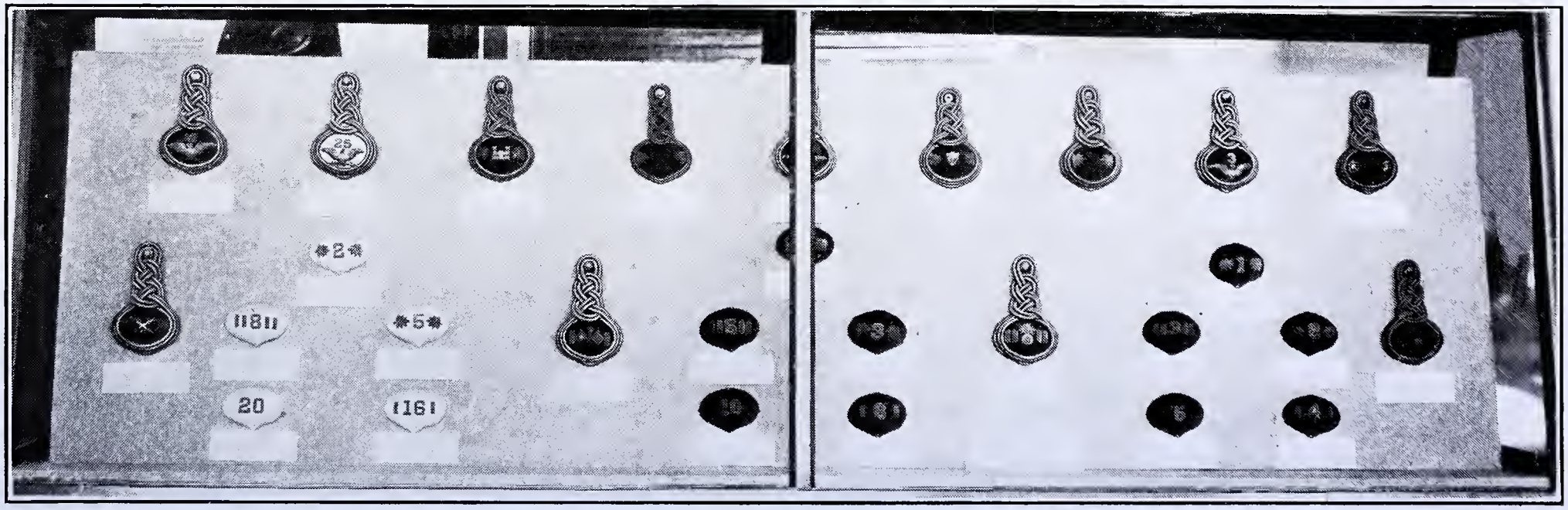

PLATE 274.—Shoulder Insignia, 1872-1902.

also of the Artillery and Cavalry sabers of the same period. The period of the Civil War was represented by examples of the Foot Officers sword, the Staff Officers sword, and by various other types of swords used during this conflict. After the close of the Civil War the number of types of swords used in the United States Army was greatly reduced and in most cases swords of a more ornate appearance were adopted. The series shown terminated with an example of the light saber which was adopted for the use of all officers in 1902.

The military exhibit also included in addition to the uniforms and swords already described a unique series of firearms, consisting of pistols, revolvers, muskets, carbines, and rifles, showing the various types of these weapons, used in the United States Army 1776-1926. (Plates 270, 271 and 272).

The central aisle of the historical space was partly occupied by three slope top cases. One of these contained shoulder knots, epaulets, and shoulder straps of the type worn by officers of the United States Army during the period 1850-1898. The second case of this type contained various pieces of United States military insignia of the types worn by officers and enlisted men during the period of the World War. The central case in this group contained a complete series of medals and decorations of the types awarded for special services in the United States Army during the period, 1862-1926. This series included the Medal of Honor, the Distinguished Service Medal, the Distinguished Service Cross, and the various campaign badges awarded to officers and men during the various wars and expeditions in which the United States has been engaged from the period of the Civil War to the present time. (Plates 273 and 274).

The second case contained a model of the *Mayflower*. This model represented an English merchant vessel of the early part of the seventeenth century such as was used by the Pilgrims on their voyage from England to America in 1620.

The third case contained a model of the United States 44 gun frigate, *Constitution*, which was authorized by Act of Congress, approved March 27, 1794, and was launched at Boston, September 7, 1797. The *Constitution* was the flagship of the Squadron of Commodore Edward Preble which sailed to the Mediterranean in August, 1803, for the purpose of prosecuting the War with Tripoli. The *Constitution* was the most famous ship of the early American navy and as such occupies a unique place in American naval history.

A special feature of the historical exhibit was a section of the large mahogany cabinet used in the National Museum for the installation of the National Philatelic Collection. In this cabinet was shown a series

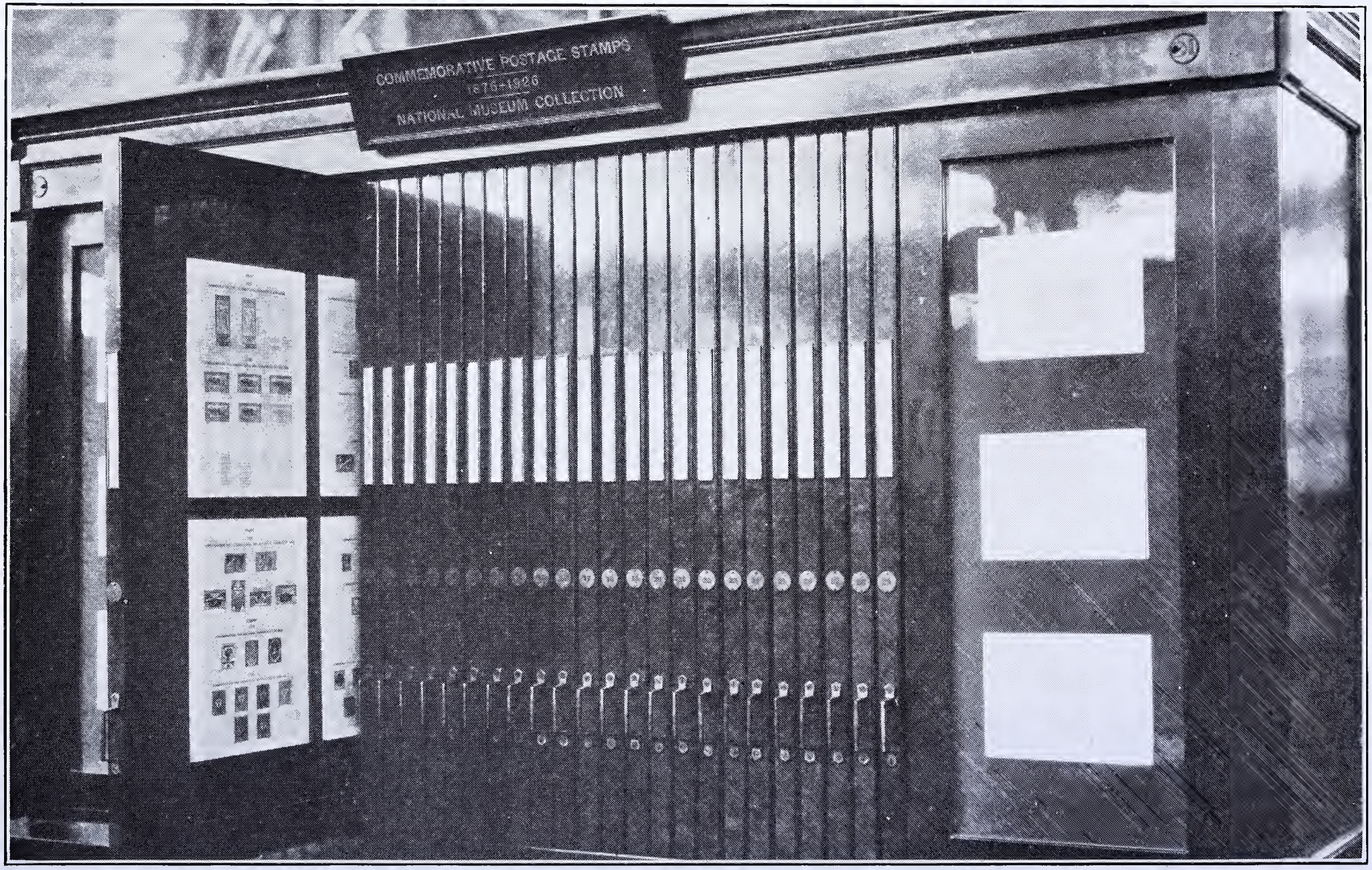

PLATE 275.—Postage Stamp Cabinet.

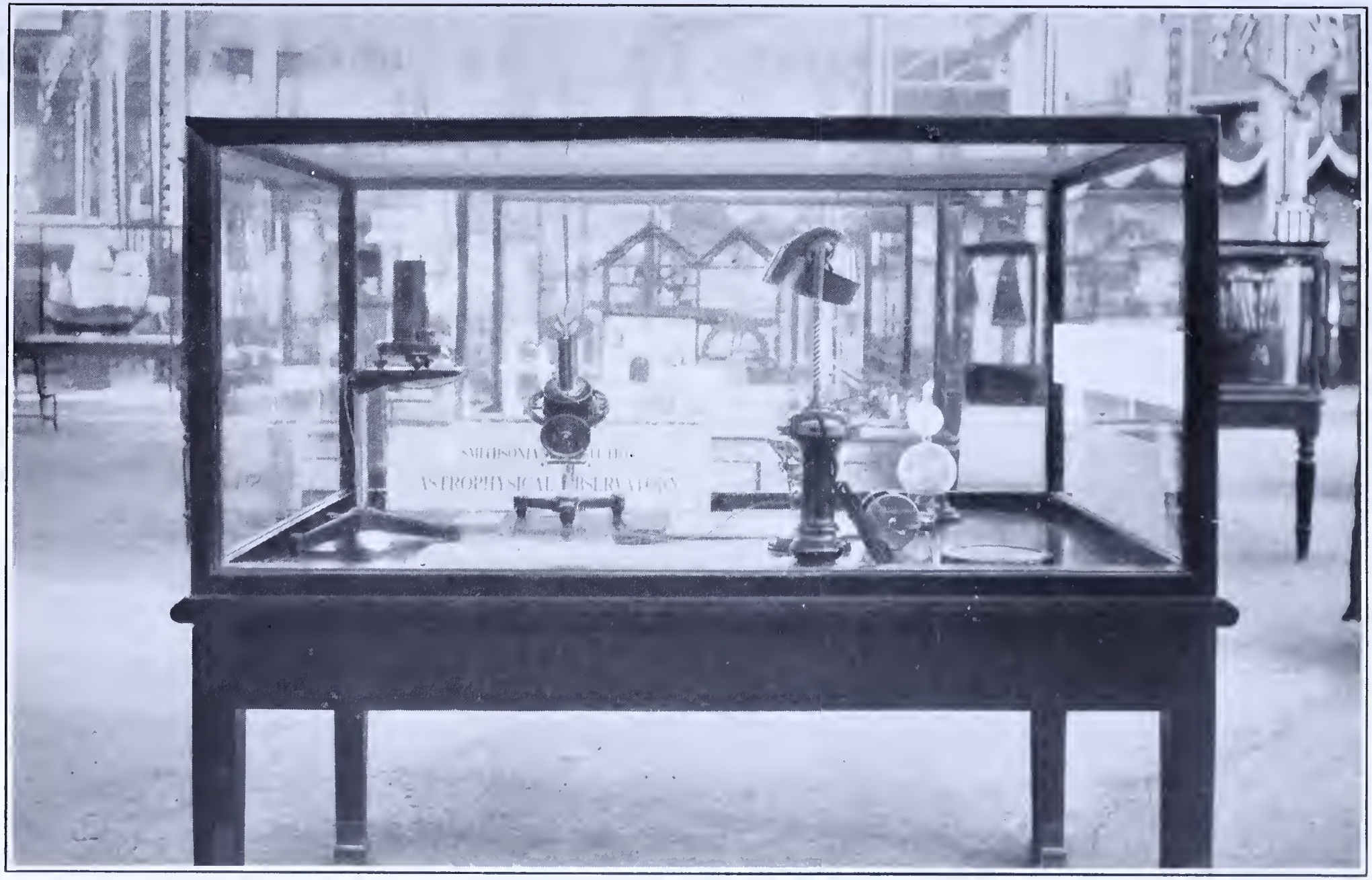

PLATE 276.—Case of Instruments of the Astrophysical Observatory, Smithsonian Institution.

of commemorative postage stamps issued during the period 1876-1926. (Plate 275).

The materials described above were selected from the Historical Collections of the United States National Museum as representative units of the vast collection of the type shown in the possession of the Museum. The methods of their display at the Sesquicentennial illustrated the methods used in the installation and labeling of similar materials in permanent exhibit form in the Museum. The materials shown in this connection represented some of the most important phases of historical museum work and the information contained in the labels illustrated the connection between the aims of the historical museum worker and those of the narrative historian. The national flags exhibited told the story of the development of the design of the United States flag, 1776-1926. The military and naval material illustrated the military and naval history of the United States during the same period. The postage stamp cabinet contained commemorative material relating to the history of the United States and foreign countries and the cabinet in which this collection was contained represented a distinct development in the science of museum furniture. The exhibit as a whole was one of exceptional interest from the viewpoint of historical museum work.

Astrophysical Observatory

The work of this bureau consists primarily of the daily measure of the heat *sent* us from the sun. Apart from the importance of any knowledge about this heat, the possibility of the application of the results to long-range weather forecasts is now stressed. The heat received at the earth is not that sent from the sun because of losses on the way to us, principally in the gases, humidity and dust of the air (Plate 276).

The following exhibits were shown:

Silver-disk Pyrheliometer: An instrument invented, constructed and standardized at the Astrophysical Observatory. Measures the heat effect of the sun's rays. The heat from the sun passes through an aperture of known size, falls on a blackened disk within the wooden encasement, heats this disk and causes a rise in the thermometer whose bulb is inserted in it. The instrument is calibrated so as to give the number of calories received in a minute on an area of one square centimeter.

Pyranometer: An instrument invented, constructed, and standardized at the Astrophysical Observatory, for measuring the intensity of radiation from any source but especially from the whole hemisphere

of the sky. Arranged in the case to indicate by the motion of a spot of light the radiation allowed to fall upon it from an electric-light bulb.

Stellite Mirror: Used in gathering the sun's heat for analysis in the spectrum.

Vacuum Bolometer: For measuring radiant energy, consists of two blackened strips, 15 by 0.1 millimeters—one exposed to the radiation (heat) to be measured, the other screened from it. In its daily use a difference of temperature between the two platinum strips of one millionth of a degree (1/1,000,000) centigrade is measurable. The sensitiveness may be increased one hundred times.

Photographs: Stations of the Astrophysical Observatory, Smithsonian Institution: Flint Island, South Pacific Ocean, 1909 (eclipse); Mount Whitney, 1909; Mount Whitney, 1910; Bassour, Algeria, 1912; Mt. Wilson, Calif., solar cooker; Harqua Hala, Arizona, 1921; Calama, Chile, 1918; Montezuma, Chile, 1921; (in case) Mt. Wilson, Calif., also Mt. Wilson, solar cooker; mirror (lower left corner) concentrates sun's heat, oven (upper right) warmed by heated oil from mirror. Twin pyrheliometer for new station at Brukaros, Southwest Africa.

Charts: Radiation received at various altitudes as measured by the pyrheliometer.

Relationship discovered by Clayton between the observed solar constants and the temperatures at Buenos Aires; the three curves are averages for four years of observations; they show the average march of temperatures for the nineteen successive days after high, medium, and low average values of the solar constant.

The variation of the sun: The sun is really variable as the monthly mean values from 1918 to 1924 plainly show. The mean solar intensity was above normal in nearly every month from August, 1918, to March, 1922, and has been below normal in every month since. If the measurements had been continued for 50 years instead of 6, we should be in a position to know whether or not the abnormalities of the weather in the different parts of the world were associated with these solar conditions. The lower part of the diagram shows daily observations in March and April, 1926. The influence of the great sun-spot group of March 22 caused a minimum, five per cent below the prevailing values of March 23. At the same time, the atmospheric transparency for green rays diminished, probably by a bombardment of the earth's atmosphere with electric particles from the sun which acted as centers of condensation of haze. The red curve shows the variation of atmospheric pressure at an Argentine station in April, 1920. There is considerable correlation between the solar variations and these variations of the bolometer.

Star Spectrum Energy curves compared with "Black-body" curves. The energy of the spectra of nine of the brighter stars was observed at

Mount Wilson, using the Nichols radiometer and the 100-inch reflecting telescope. The accompanying curves show the results reduced to the normal wave-length scale, with atmospheric and instrumental losses eliminated. The curves have been extended into the blue and violet regions by using the data of Wilsing, Scheiner, Munch and Rosenburg. With each curve of star observation is drawn a smooth curve of the distribution of energy in the spectrum of the "Black-body" or perfect radiator. The temperatures chosen are such as to present the star spectrum distribution, as well as possible. The scales of ordinates is such as to make the area under each curve proportional to the energy received from each star at the earth's distance. It is possible to compute the diameter which a "Black-body" must have in order to give this energy.

CIVIL SERVICE COMMISSION

CIVIL SERVICE COMMISSION

Foreword

The Civil Service Commission was organized forty-three years ago at which time it embraced 13,294 employees in the departments at Washington, and in those post offices and custom houses that had over fifty employees. In 1925, there were more than half a million officers and employees, covering nearly every branch of the Government service throughout the country. The duties now demanded by the Federal Government include practically every line of human endeavor. The merit system controls appointments, and civil service gives protection of place and secures permanency of occupation, the two factors that have enabled the Commission to elevate the standing and general efficiency of the federal employees to the high plane they now occupy.

The importance and extent of the work of the Civil Service Commission cannot be measured by the area occupied in the Exposition. It makes contact with nearly every organization of the government, and its activities stretch throughout the length and breadth of our country, even to the far away islands of the Pacific; it extends a protecting hand over the greatest labor organization in the world, and the value of its work through its competitive examinations in dignifying labor and advancing education is beyond measure.

Exhibit of
Civil Service Commission
at the
Sesquicentennial Exposition
1926

Introduction

The exhibit was designed to show the connection of the Civil Service Commission with all branches of the executive Civil Service through its function of recruiting the personnel in the classified service. The scientific examination methods employed in recruiting the personnel and the saving to taxpayers resulting from the competitive-examination system. The extent to which the competitive-examination system has been applied in the Federal Service and the extent to which the competitive-examination system has been adopted by state, city and county governments. The organization of the Civil Service Commission throughout the United States proper and its Insular Possessions and the magnitude of the work of the Commission.

Description of the Exhibits

The exhibit of the United States Civil Service Commission occupied a floor space 17 x 35 feet in size. (Plate 277).

The central exhibit was a map, hand painted on metal, which showed the organization of the Civil Service Commission by means of timed flashes of electric lights in four colors. The map was surmounted by a colored transparency of the seal of the Commission.

A booth at the left showed typical tasks of the Government bureaus depicted on colored lantern slides projected by an automatic stereopticon. The series included lettered slides which pointed out the connection of the Civil Service Commission with all the bureaus through the competitive-examination system, the practical and scientific nature of examinations, and the economy of the merit system as compared with the spoils system in public employment. The legend on the front of this booth was "A Few of the Thousands of Important Things Your Federal Civil Employees Do for You."

The booth at the right enclosed a small automatic motion picture machine which showed scenic Washington. The legend on the front of the booth was "Washington, the Heart of the Nation, the City Beautiful." In this exhibit emphasis was given to the function of the Com-

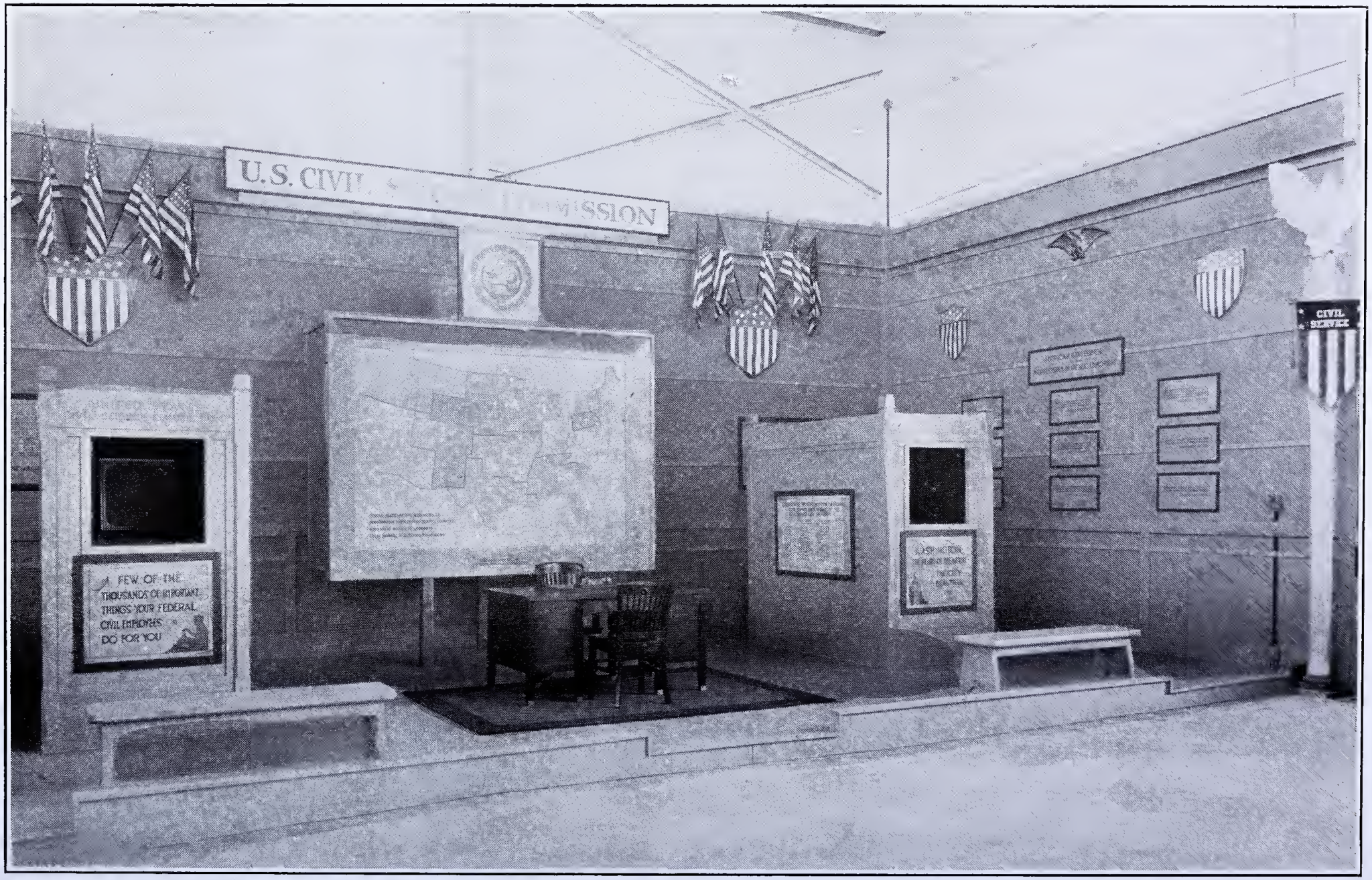

PLATE 277.—Exhibit of the United States Civil Service Commission.

mission in furnishing the personnel to operate the executive departments and the economic advantages of the competitive-examination system.

A card display on the right-hand wall was made up of brief excerpts from speeches of outstanding American statesmen on the merit system in public employment.

Other card displays on the sides of the booths and on the walls showed the extent to which the merit system has been adopted by states, cities, and counties; the gradual extension of the competitive-examination system in the Federal service, beginning with the passage of the civil service law in 1883; the extent of the Commission's work as represented by the number of persons examined, passed, and appointed each year for a number of years; the reduction in the Federal civil force since the armistice, etc.

The walls of the exhibition space were covered to a height of fifteen feet with burlap in natural color. The panels of the booths were treated in the same way.

All woodwork was gray with decorations in yellow.

The card displays had a yellow base, were lettered in black, with decorations in orange and light green. The frames were dark green.

The attendant in charge was supplied with the publications of the Commission, examination announcements, and application blanks, and was prepared to give any desired information relative to the work of the Commission.

THE UNITED STATES SHIPPING BOARD

THE UNITED STATES SHIPPING BOARD

Foreword

The United States Shipping Board is an independent establishment of the executive branch of the Government, charged with certain matters designed to conserve and promote the shipping interests of the United States.

The exhibit made by the Shipping Board was an attractive and interesting one. The installation was admirable, well balanced, not overcrowded, and its location was ideal for "capturing" the visiting public. It possessed many educational features illustrating the function and administrative faculty of our Government, but its general character was commercial, having a distinct advertising value. evidently designed to secure definite and measurable results.

The most prominent object was a great aluminum relief map of the world, forty feet long and sixteen feet high upon which many things were shown regarding land conditions, ocean currents, and all the trade and service routes of the Shipping Board, indicating their itinerary and ports of call as well as other important things of interest to sightseers, commercial agents and ocean travellers.

The outstanding exhibit was the beautiful and costly model of the mammoth steamship *Leviathan*, the largest and finest passenger ship in the world. With the *Leviathan* were other models of smaller ships, all designed to show what the United States Shipping Board is doing to equip our foreign commercial and passenger services with swift and commodious steamers flying the American flag.

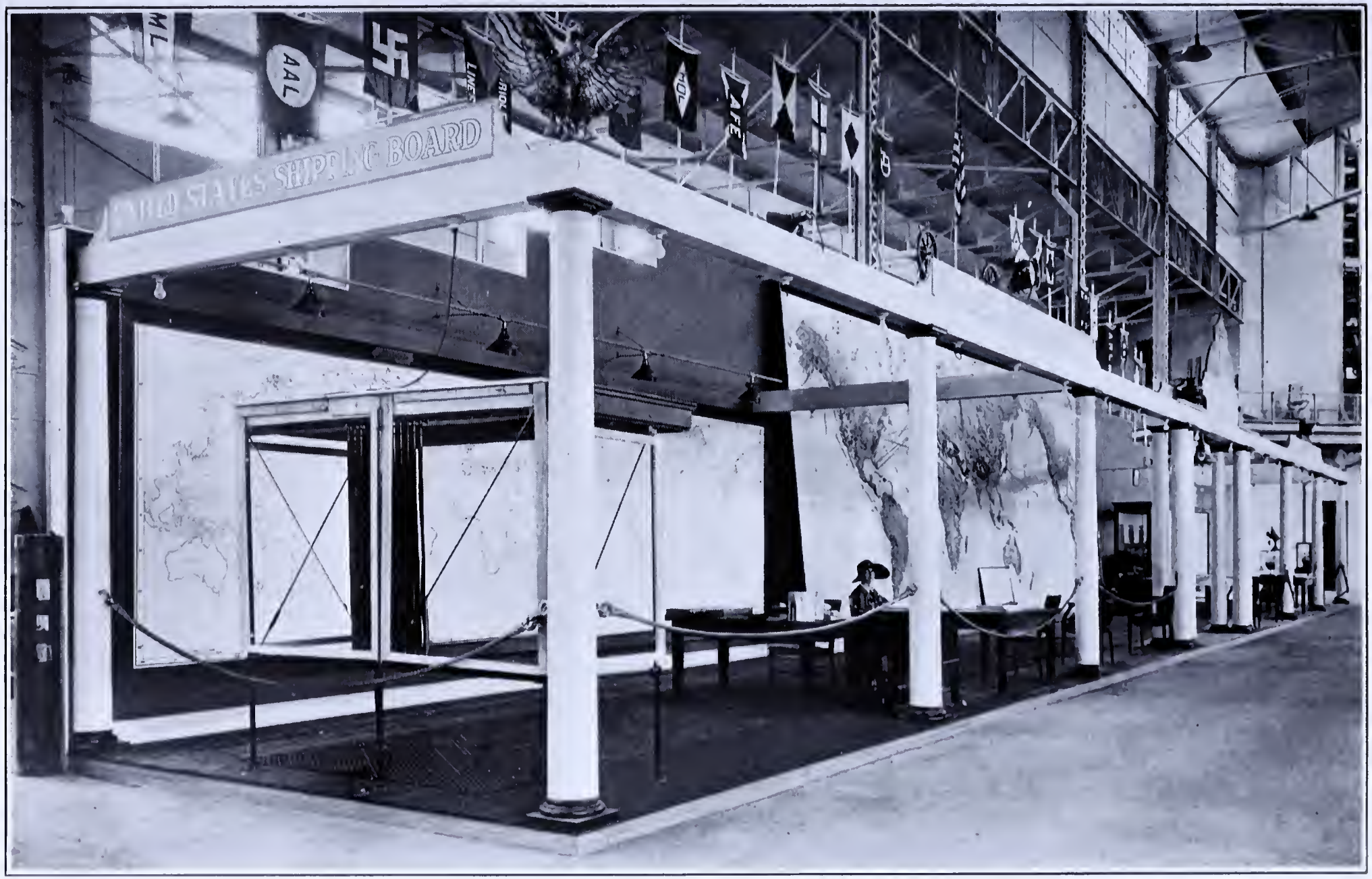

PLATE 278.—Exhibit of the United States Shipping Board.

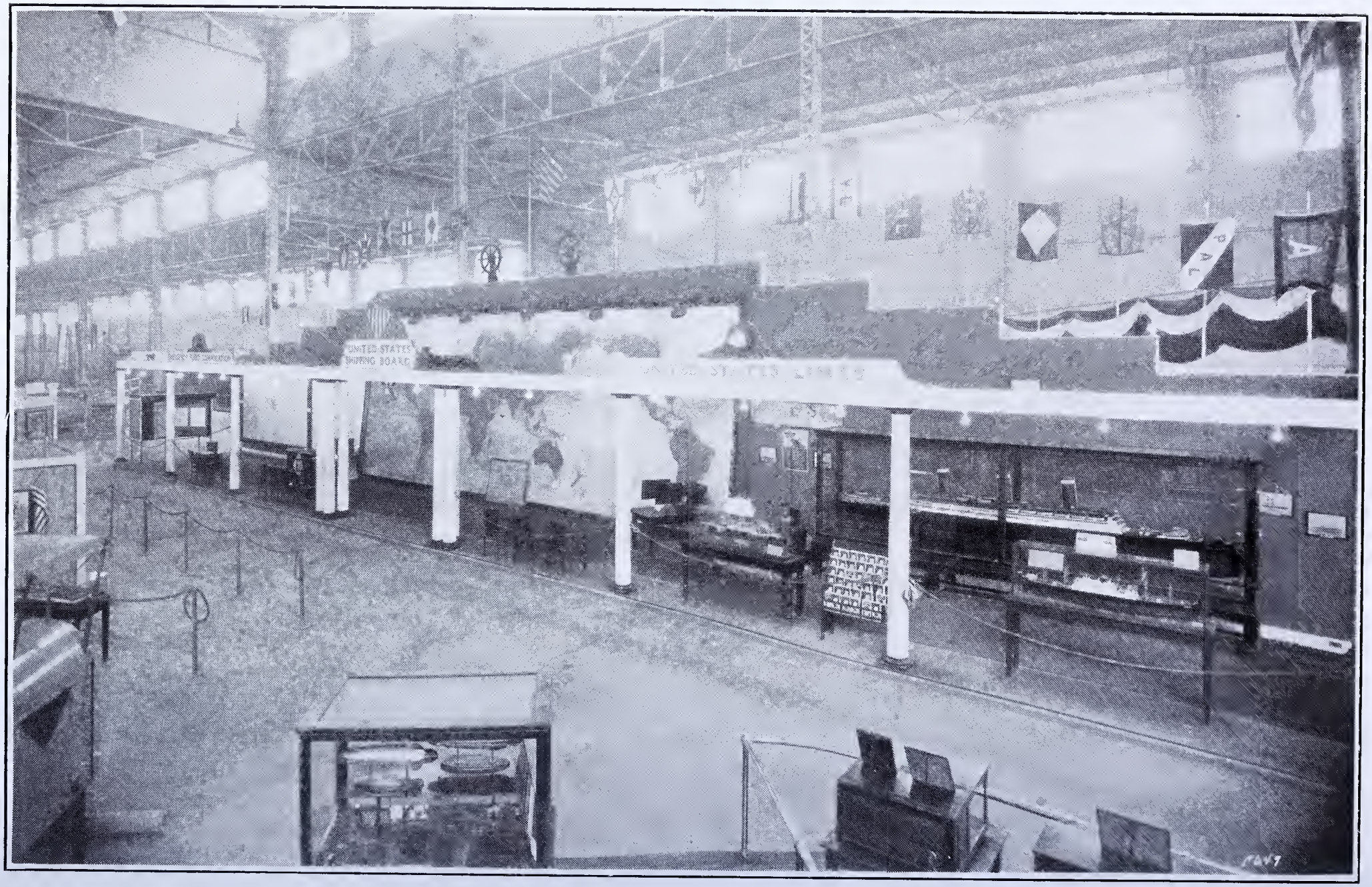

PLATE 279.—Exhibit of the United States Shipping Board.

Exhibits of the United States Shipping Board at the Sesquicentennial Exposition 1926

Introduction

The exhibit of the Shipping Board was intended to be one of education to those who are not familiar with the Merchant Marine problem, and one of information to those whose daily activities bring them in contact with the commerce of the United States, particularly as it is affected by shipping.

The physical appearance of the exhibit, together with the unusual character of some of its main features, attracted immediate attention and held the interest of all who saw it; and as a result, both the initiated and the uninitiated in the maritime affairs of the United States gained knowledge not only on the important question of the American Merchant Marine but on the part being played by the Shipping Board in its development.

Description of the Exhibits

The Shipping Board booth occupied a space 100 feet long by 15 feet wide. The rear of the booth consisted of a wall 18 feet high from a point 21 feet 3 inches each side from the center of the booth. This wall was stepped down to 10 feet at the extreme ends, giving the effect of four steps 7 feet in length, each with a drop of 20 inches. (Plates 278 and 279.)

A wood floor was constructed over the entire length and width of the booth giving a floor space of 1,500 square feet. On the front edge of this floor, round columns 10 inches in diameter and 10 feet high were placed, spaced on 14 foot centers.

Above the 12 foot entrance the United States Shipping Board shield was worked into a design which included a large sign, with the words "UNITED STATES SHIPPING BOARD" in gold leaf. Directly below this sign and on the face of the girder over the center entrance were the names of the Chairman and Commissioners.

There was placed on each side of this sign a port and starboard light box in which running lights were placed and illuminated. A 12 inch diameter ship's bell was hung directly below the box girder over the center of the entrance.

Midway between the entrance of the booth on each side a sign was placed on top of the box girder 10 inches high and 14 feet long on top

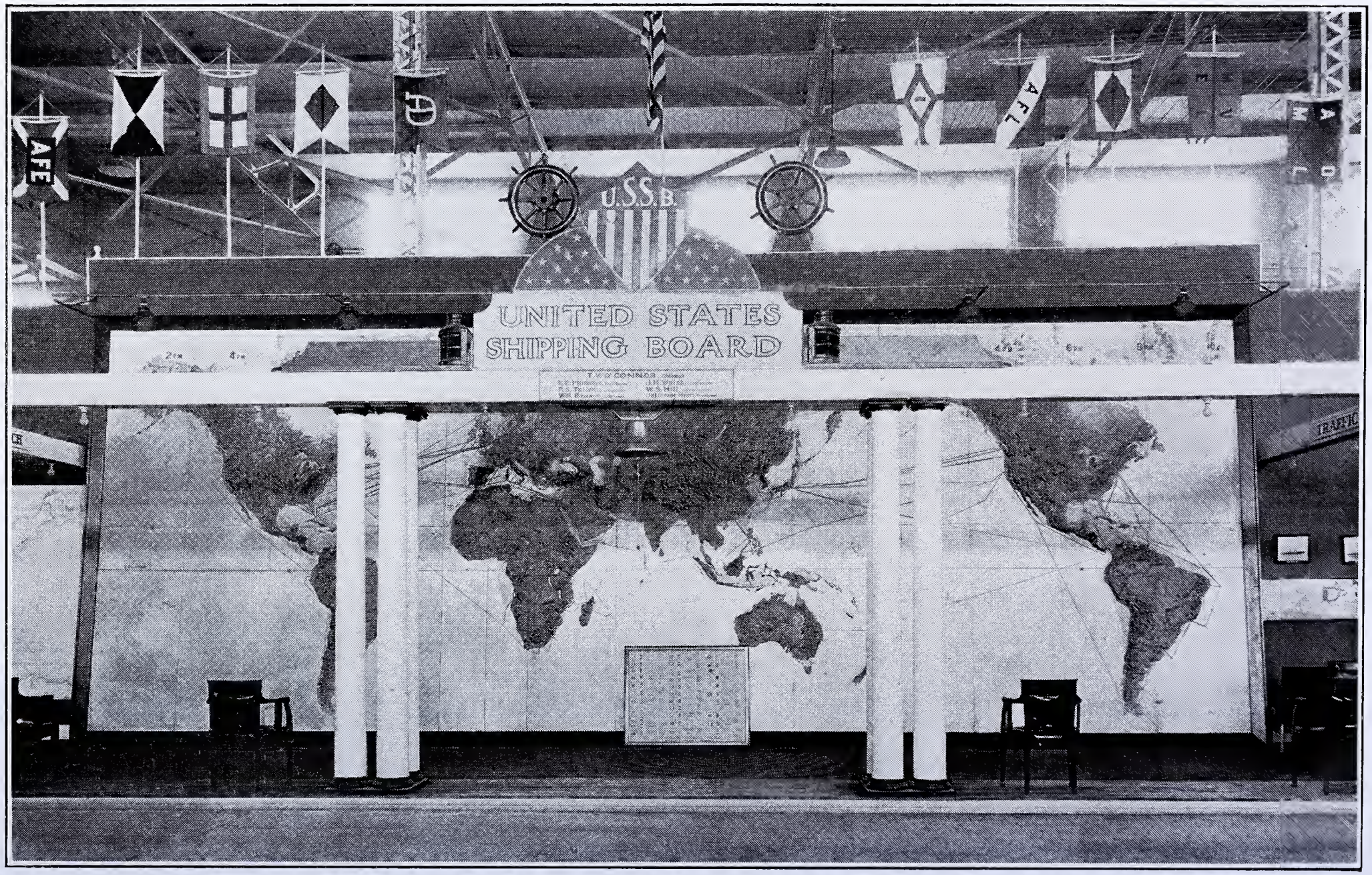

PLATE 280.—Exhibit of the United States Shipping Board.

of which a ship's clock was fastened to a frame-work suggesting a tambour clock design. One sign bore the words "EMERGENCY FLEET CORPORATION" painted in gilted letters with a white background, the other had the words "UNITED STATES LINES" painted in a similar manner. The framework supporting the ship's clock was painted a mahogany color.

The entire rear wall was covered with blue burlap and the steps at the top edge of the rear wall as well as the middle parallel portion of the rear wall was capped with a facing piece which was painted white enamel. The columns and girders were also finished in white enamel. The manila rope suspended between the columns was gilted.

The equipment used for decorative purposes, such as the port and starboard lights and light box, ship's bell, Shipping Board shield, ship's clock, manila ropes and end fittings, together with the house flags was actual ship equipment.

Main Objects of the Exhibit

The Relief Map of the World displayed at the Exposition was of cast aluminum, drawn on the Mecator projection plan, being forty feet in length and sixteen feet high. (Plate 280). The relief portions were at the ratio of sixty to one of actual elevation, thus accentuating the topography of the continents to properly portray the mountainous regions. The map was colored to appropriately show the climatic conditions of the land, from the frozen areas of the polar regions, depicted by the shading in white, grain producing sections in delicate brown, the barren desert wastes in light yellow and the fertile valleys in rich green. The water areas are also tinted and the ocean currents accurately shown in their courses and the effect of these currents upon the climatic conditions of the countries at which they touch can be seen from the colorings of the land portions. Thus a study of the map would show how the Gulf stream gives to England a climate similar to our Middle Atlantic States though it lies in the latitude of Labrador. Similar climatic conditions in other countries can be explained by a study of the ocean currents as shown on the map.

The Western Hemisphere is shown twice in order to give the Round-the-World aspect to the map, and by use of varicolored ribbons we were able to trace out the routes of all Shipping Board trade routes and indicate their itinerary and ports of call. The routes of all of the services sold for guaranteed service were also indicated, a red, white and blue ribbon being used to trace out their course. A legend was displayed showing the names, house flag and stack markings of the various services, together with the ribbon used to show the routes of the

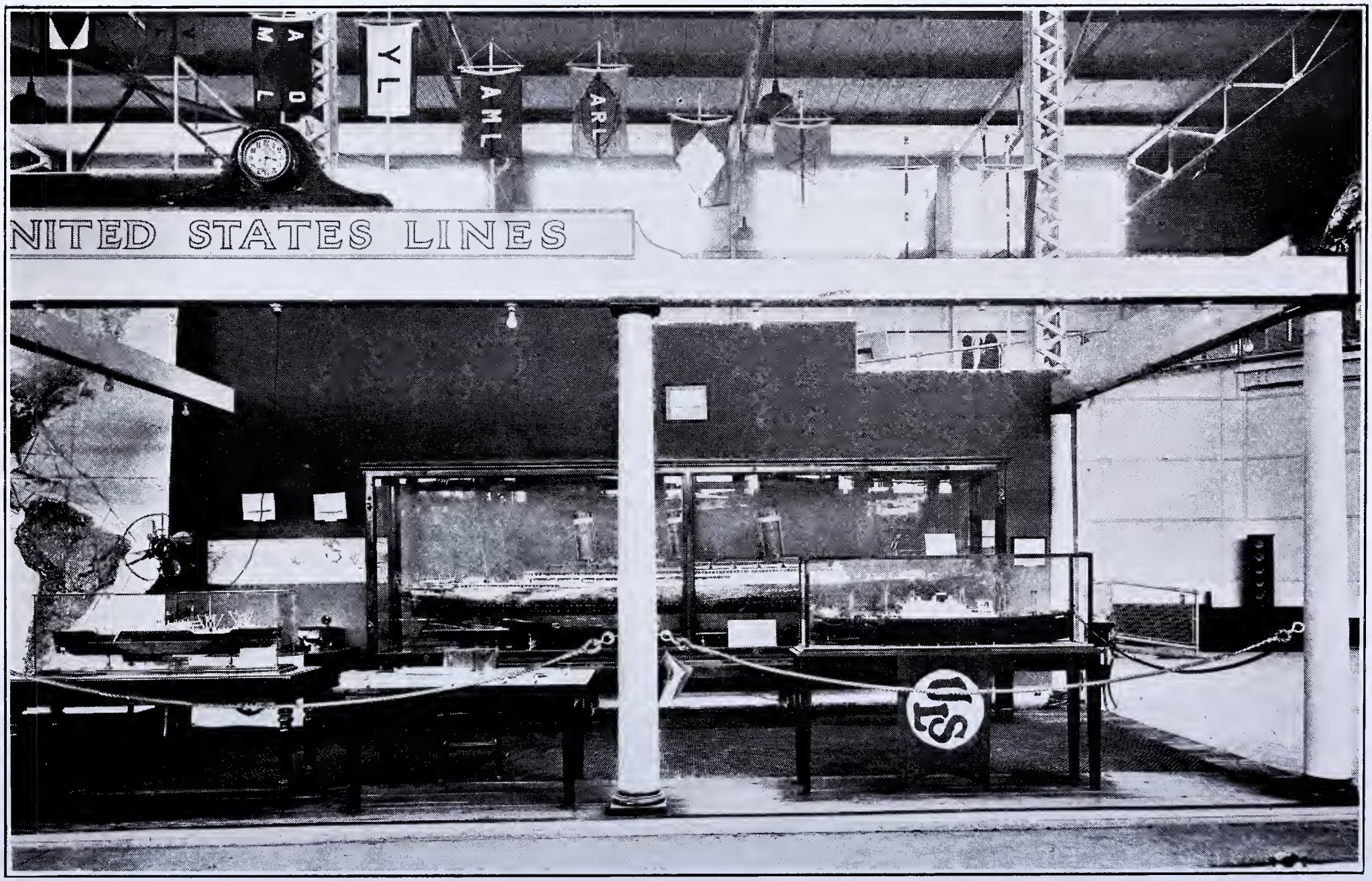

PLATE 281.—Exhibit of the United States Shipping Board.

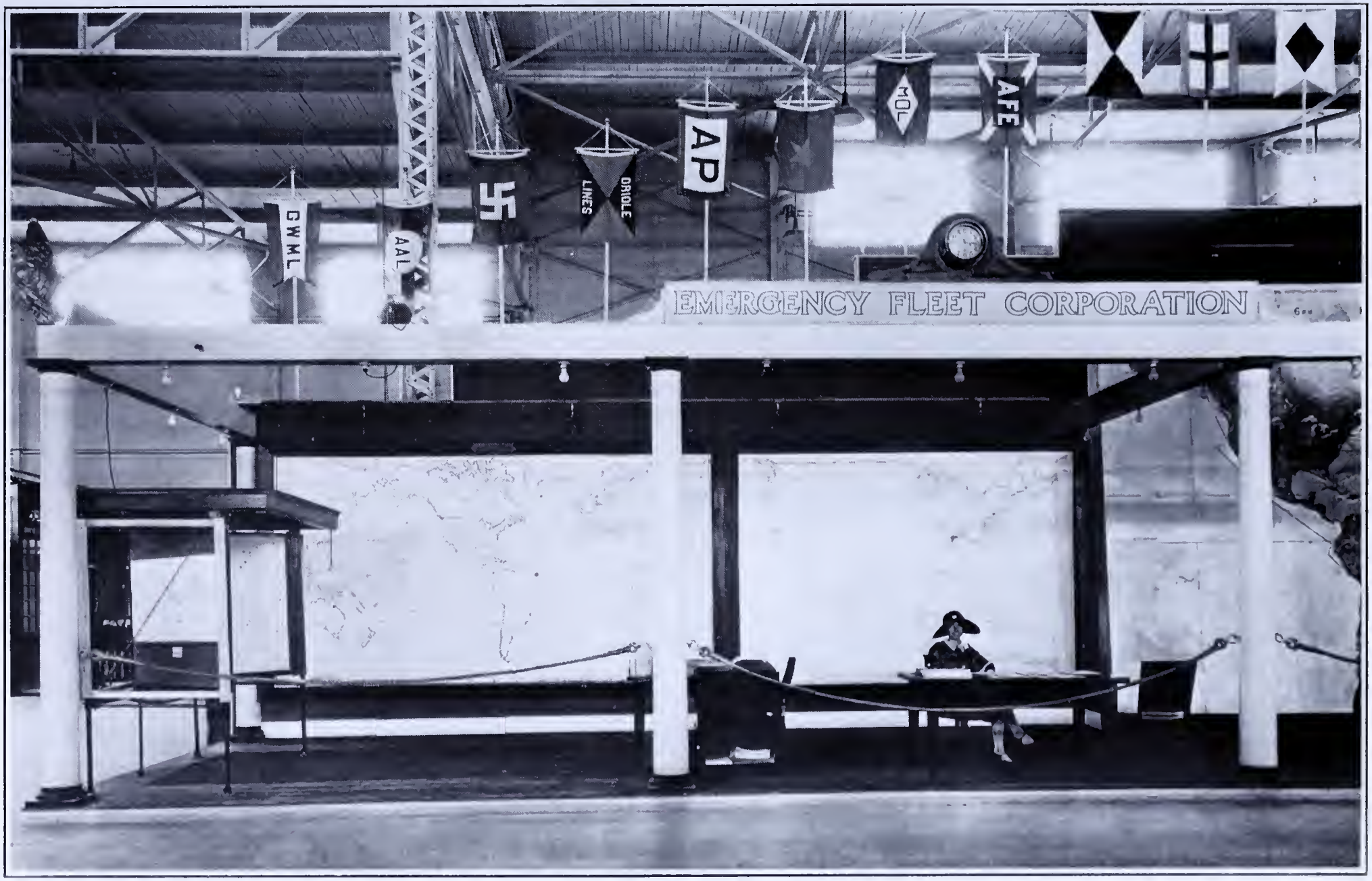

PLATE 282.—Exhibit of the United States Shipping Board—Map showing domestic ports.

various services. In this way visitors were able to trace out the route of any service in which they were interested.

A feature of the exhibit which attracted much attention was the model of the steamship *Leviathan*, the queen of the American Merchant Marine and the pride of the entire American people. This model, nearly twenty feet in length, portrays every detail of the great ship's exterior, and its beauty was enhanced by electric lighting within the hull. (Plate 281).

Two other models of passenger vessels were also on display, a five foot model of the 535′ type and the Hog Island type "B" vessels. The interest in these models was great, owing to the fact that many of the visitors at the booth had traveled on some of the boats these models represented or others contemplated traveling on them on future trips. Moving pictures depicting life aboard one of the United States Lines' vessels were shown as were pictures of the rescue of the crew of the British freighter *Antinoe* by the *President Roosevelt* and this also added to the interest of the visitors.

The exhibit of the Bureau of Research of the Shipping Board consisted of material prepared by the Division of Statistics of the bureau, which maintains records of the movements of all vessels and cargoes entered and cleared at American ports in foreign and intercoastal commerce. These are the only records of this kind in existence, and furnish to interests affected by transportation conditions, information of inestimable value not obtainable through any other agency in the world.

The presentations displayed in the exhibit were necessarily confined to only a few examples of the types of information made available through the records of the Bureau which are so constructed as to permit the assembly or segregation of any classification or grouping desired of all essential facts related to the movement of ships and traffic in the commodities carried. On a large map of the United States, colored jewels marked the approximately 200 domestic ports through which the foreign commerce of 1925 was conducted. (Plate 282). Different colors of jewels indicated those ports which handled only exports, those which handled only imports and those handling both imports and exports. A large map of the world carried in similar manner designations of about 1,600 foreign ports involved in the 1925 foreign commerce of the United States. A series of smaller maps showed graphically the scope of the foreign commerce of various states and ports of the United States; also the foreign origins of important import commodities and the foreign destinations of leading export commodities.

The display also included a large number of photographic illustrations of activities of United States Shipping Board vessels in various parts of the world.

UNITED STATES VETERANS' BUREAU

UNITED STATES VETERANS' BUREAU

Foreword

The United States Veterans' Bureau presented an excellent picture of its activities in hospital care and relief of disabled veterans of late wars. The exhibit occupied a floor area of about 1,100 square feet, located near the east entrance to the Government Palace, the white and tastefully decorated exhibit booth, of original design, giving it marked distinction and prominence. Within the booth were comfortable chairs and inviting settees that drew many visitors to the space where they were received by courteous attendants who explained the exhibits, or told about the curative value of occupational therapy now being successfully applied in the treatment of patients in more than fifty of the Bureau's hospitals scattered throughout the United States.

Among the exhibits were many articles of art and utility made by the hospital patients adding attractiveness as well as a human touch to the display. Some of these objects were strikingly illustrative of the patience and perseverance of the American soldier working under the handicap of physical and mental impairment.

On the wall at the back of the general exhibit were a number of extremely interesting charts describing the character and magnitude of the work of the Bureau. From the analyses of these charts one learns with satisfaction that an earnest effort is being made by our Government to pay as far as may be possible the tremendous debt due the young men who offered their lives and sacrificed limbs and health in responding to the Nation's call to meet the great emergencies of war.

PLATE 283.—Exhibit of the United States Veterans' Bureau.

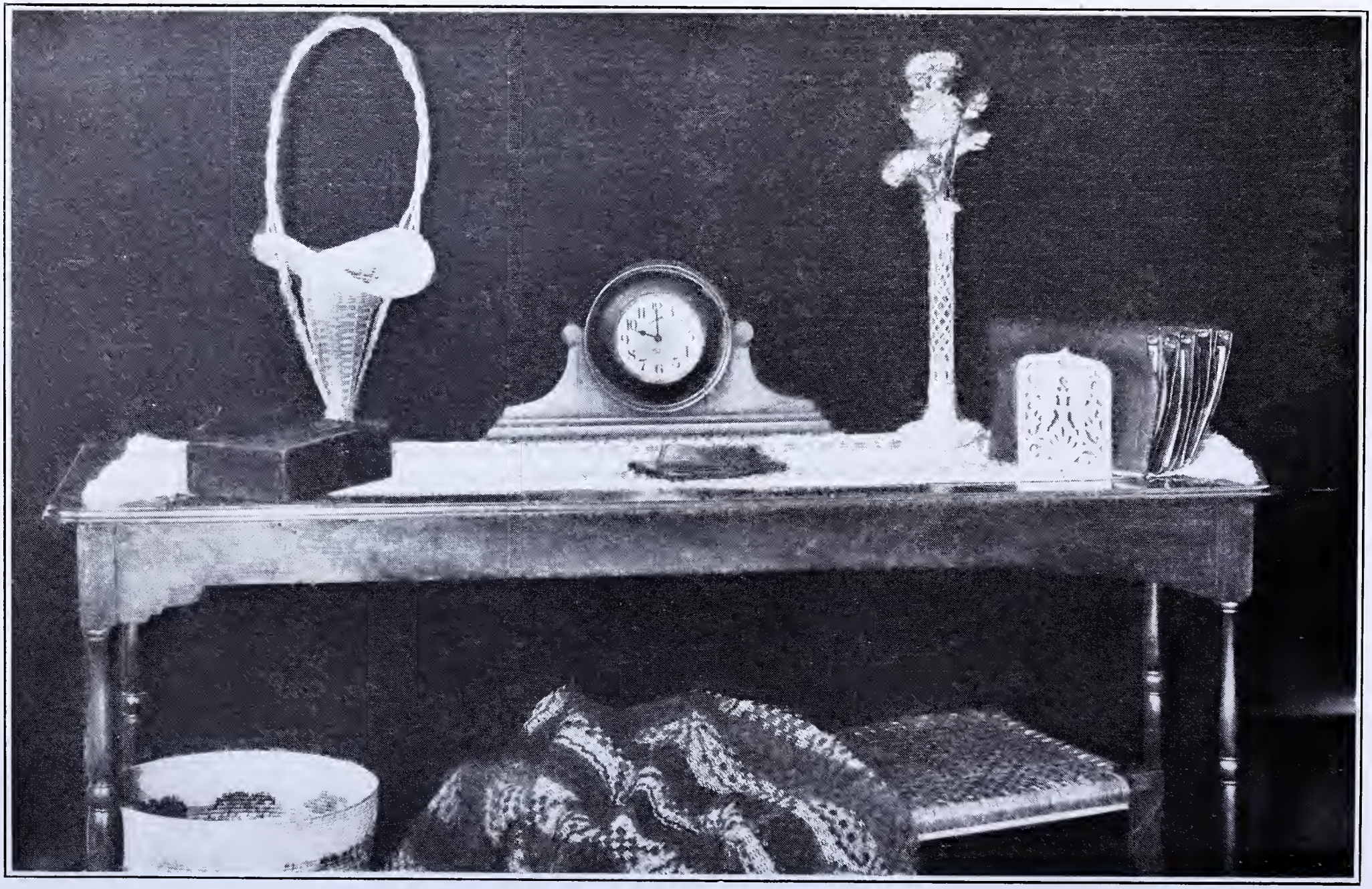

PLATE 284.—Exhibit of Occupational Therapy.

Exhibits of
United States Veterans' Bureau
at the
Sesquicentennial Exposition
1926

Introduction

The exhibit was composed chiefly of projects made in the course of medical treatment and was presented to illustrate the scope and method of using Occupational Therapy in Veterans' Bureau Hospitals. (Plate 283). The Veterans' Bureau is making large use of this therapeutic measure than any other agency, either governmental or civilian. In more than fifty hospitals located in various parts of the country, the Bureau is using manual and mental occupations in treating the sick.

Description of the Exhibits

Occupational Therapy

This exhibit comprised contributions from the majority of the hospitals and the variety of crafts, occupations and forms of recreation represented was almost as diverse as the location of the hospitals themselves. (Plates 284 and 285). The location of the hospital often suggests the treatment to be prescribed for the patients.

Occupational Therapy is used with nearly all classes of disease. The larger number of hospitals under the direction of the Veterans' Bureau are now treating mental or tuberculous patients, as the case may be, and it is in these hospitals that very splendid results have been obtained from the Occupational Therapy prescription.

Various evidences of these prescriptions in the form of furniture, handicrafts and pictures of agriculture and poultry were scattered about the booth, but the real results of the treatment are indicated in the effect the production of these things has had on the patient. These effects are carefully recorded in detail and a case history for every exhibit in the booth was on file and available for reference. With the tuberculous and mental cases which must be hospitalized for months, Occupational Therapy is most valuable. The making of some simple article such as a reed basket or tray for a friend, or a tooled leather bag, which may be sold to help in the support of his family, assists in

PLATE 285.—Exhibit of Occupational Therapy.

keeping the patient contented during the long days of hospitalization and the contented patient always makes the best progress toward health.

A young man entered a western hospital with tuberculosis of the right knee and pulmonary tuberculosis, quiescent,—had become very restless after a long siege in bed and so discontented that medical progress was difficult. The surgeon in charge prescribed Occupational Therapy and rake knitting was the first occupation given. With improvement in his condition reed work was allowed. He became very interested in this and admitted that now he was willing to make the long fight required for a cure. Later he was attracted to leather work and has developed a splendid technique in this craft. He is giving this craft serious attention with the idea of following leather work as a vocation upon his discharge and so has come a contentment of mind, a new hope in the future and a new courage to carry on.

In the mental hospitals the procedure is similar, instead of allowing a mental patient to sit about in idleness, some line of activity is prescribed (preferably out of doors) which possesses an appeal to him. He may be taught to make bright colored rugs or he may be taken to the poultry yard or the flower or vegetable gardens where the surroundings are pleasant and the interest aroused by seeing things grow turns his mind from dwelling upon himself and his troubles, either real or imaginary, thus inducing a more healthful state both of mind and body.

Occupational Therapy has assisted many a deteriorated patient with poorly coordinated mind and muscles to come back gradually to a condition which permits his return to his home and family. It may be necessary first to use the simplest kindergarten methods with the patient, but Occupational Therapy is progressive and he is urged to advance to more intricate occupations as fast as is consistent with good medical procedure.

The avenue of approach to the patient is the trained aide. She is the doctor's assistant,—the medium between the doctor and the patient. She must know enough phychology to probe into the patient's background and dig out facts which are sometimes of the utmost importance to the doctors in diagnosing the case and its treatment. She must be sympathetic, neither maudlin nor cold, but with a real sympathy and judgment which will win confidence and friendship among her patients. She must be resourceful, and versatile to meet the diverse tastes of her men.

The following is a case illustrating the method of applying progressive Occupational Therapy to a mental patient and its results on

the patient: (Although crafts and out-of-doors activities rather than academic work are usually prescribed for the mental case and in this respect the illustration is not typical, the progress of the Therapy is so good that it is here given.)

> This young man, 29 years old, had been a metal buffer by trade. When committed to the hospital, he was dull, depressed and untidy and spent his time picking splinters off the floor or trying to hide himself. His education was that of a third grade pupil, he could barely read and write and could not distinguish one color from another. One week after admission he was approached by his aide and induced to make a colonial mat. It was hoped that his interest would be aroused and introspection forestalled, but he could not be induced to continue, and for over a year all attempts to interest him failed, he became worse and was frequently confined in the disturbed ward. During one of these periods he was attracted by the academic courses being given to other men and began in a desolutory way to study reading, writing, arithmetic and English. Soon he was working regularly in these classes and had started raffia baskets as a diversion. The academic work resulted in ability to coordinate, improved power of judgment, reasoning and expression. From this time on his improvement was steady. His taste for reading improved and his choice of books included "Tales of Two Cities," "Silas Marner," "Bryce's American Commonwealth," etc. His attention was attracted to typewriting, but he still retained his interest in raffia, and his baskets became very pleasing both in color and design. His practice in typing developed accuracy and neatness and soon resulted in a desire for a business course and he began the study of commercial law. This study lead to an interest in current events and brought out a capacity for cool-headed logical reasoning.
>
> He was discharged in 1926—not only cleared up mentally, but equipped to compete successfully with his neighbors and thus safeguarded from situations which might cause subsequent mental confusion. In treating this case every study prescribed was advised with a definite purpose in mind, every effort made was an attempt to hold out to a disturbed confused mind something by which it could be opened up and lifted up from apathy, depression and delusions of unworthiness to expression of, and confidence in, itself.

As no two cases are alike, this same combination may never be used again for the work prescribed is that which is best adapted to each

patient's peculiar needs and which will best assist in taking him as far as possible toward a complete recovery.

The cases referred to above are examples of the use of Occupational Therapy as shown by this exhibit. The Occupational Therapy exhibit comprises about 300 articles—the corresponding histories of which are similar to those quoted.

Descriptive Charts

Nineteen charts describing the work of the Veterans' Bureau were in the collection of this exhibit. The subjects of these charts were as follows:

I Analyzing Active Awards for Disability Compensation

II Analyzing the Disability Compensation Claims

III Analyzing Benefits Under the Adjusted Compensation Act
The Adjusted Service Certificate Fund, Value of Certificates Issued, and Death Awards Authorized

IV Analyzing Benefits Under the Adjusted Compensation Act
The Appropriation "Adjusted Service and Dependents Pay" and Value of Cash Payments under Direct and Dependents' Awards.

V Analyzing Governmental Expenditures for all Purposes Since the Fiscal Year 1860, with a Special Reference to Expenditures on Account of, or as a Result from, Wars Engaged in by the United States

VI Analyzing Governmental Expenditures for all Purposes Since the Fiscal Year 1860, with a Special Reference to Expenditures on Account of, or as a Result from, Wars Engaged in by the United States

VII Analyzing Disbursements by United States Veterans' Bureau, by Fiscal Years, 1918 Through 1926

VIII Analyzing the Benefits Paid Directly by the United States Veterans' Bureau Each Month to Ex-Service Men and Women and Their Dependents, from December, 1917, Through April, 1926

IX Showing the Relationship Between Pensions and United States Veterans' Bureau Benefits

X Analyzing the Distribution of Monetary Benefits Granted by the United States on Account of all Wars

XI Showing the Actual Number of Patients of the United States Veterans' Bureau Remaining in all Hospitals, from October, 1919, through June, 1926

XII Showing the Opening and Closing Dates of U. S. Veterans' Hospitals

XIII Analyzing the Actual and Expected Development of United States Veterans' Hospital Facilities under all Appropriations and Authorizations

XIV Analyzing the Extent of Hospitalization of Patients of the United States Veterans' Bureau in Their Home State

XV XVI & XVII Showing the Relationship Between Monthly Installments Paid Out Under Approved Term Insurance Claims versus Premiums Actually Received by Holders of Term Insurance Policies

XVIII & XIX Showing the Development of Vocational Rehabilitation Activities from December of 1918 Through June 30, 1926

THE FEDERAL BOARD FOR VOCATIONAL EDUCATION

THE FEDERAL BOARD FOR VOCATIONAL EDUCATION

Foreword

The Federal Vocational Education Board's exhibit adjoined that of the Veterans' Bureau, extending southward 40 feet along the east aisle. The exhibit was a small one but covered a most appealing subject —the vocational rehabilitation of civilians disabled in industry or otherwise. The feature exhibit was a painting, 20 by 40 feet depicting scenes in the life of a community where the Federal Government is cooperating with the state in conducting vocational education activities.

Exhibits of
The Federal Board for Vocational Education
at the
Sesquicentennial Exposition
1926

Introduction

The exhibit of the Federal Board for Vocational Education occupied a space 17 x 42 feet, the rear wall of which was completely covered by an oil painting 12 feet high entitled "Vocational Education in the Life of a Community." (Plate 286).

Description of the Exhibits

This painting was reproduced in colors and distributed from the booth as a folder that contained a description of the picture and a catechism designed to advise visitors to the Exposition of the work of the Federal government in promoting vocational education for normal people, and vocational rehabilitation for persons disabled in industry and otherwise. Approximately 100,000 copies of this folder were distributed. At each side of the space allotted to the Board was an automatic picture projecting machine, detailing, so far as possible, in story-telling form, the work of the Board in its several divisions dealing with agriculture, trade and industry, home economics, and commercial education, and civilian vocational rehabilitation. On the rear rail running the entire length of the booth for the purpose of protecting the painting, there were tables on which were displayed copies of publications of the Board available either for free distribution or distribution by sale by the Superintendent of Public Documents, Government Printing Office. Arranged around the booth so as to be as attractive and visible as possible to visitors, were standard type display boards showing symbolic paintings and actual photographs of the work of the various services of the Board.

Two persons demonstrated the exhibit throughout the entire period of the Exposition.

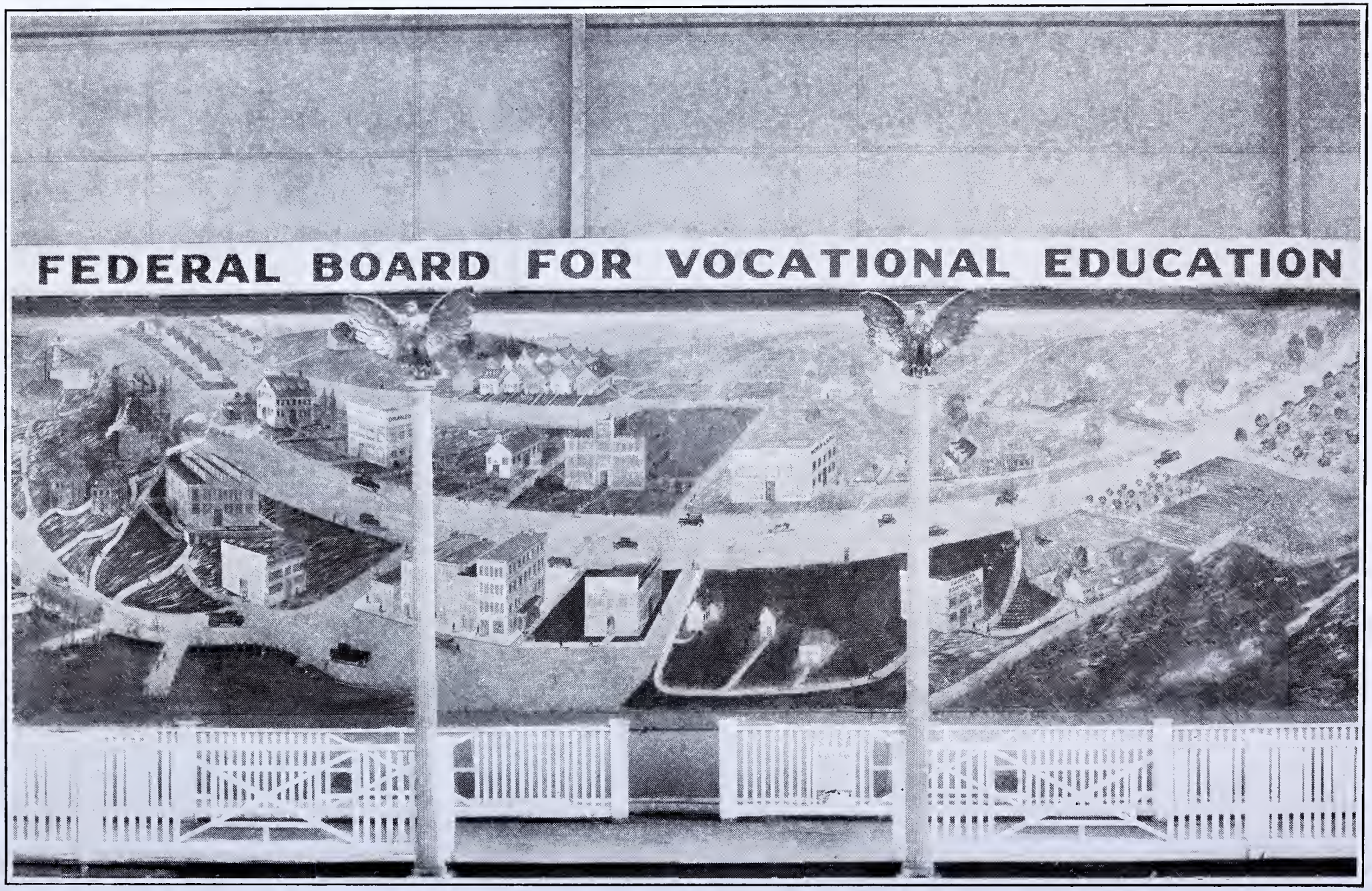

PLATE 286.—Exhibit of the Federal Board for Vocational Education.

THE PANAMA CANAL

THE PANAMA CANAL

Foreword

One of the greatest engineering achievements in history is the building of the Panama Canal. It cut the Western Hemisphere in two, and opened trade routes that have promoted commerce and advanced civilization beyond all calculations.

The exhibit consisted of a relief map, 10 by 50 feet, showing the waters of the Canal and adjacent territory. A wall map of the Canal Zone together with a number of charts and photographs completed the Canal story, in which visitors manifested much interest.

Exhibits of the Panama Canal
at the
Sesquicentennial Exposition
1926

Introduction

The exhibit of the Panama Canal (Plate 287) consisted of a relief map of the Panama Canal and a portion of the Canal Zone, and 26 photographs, wall maps and charts.

Description of the Exhibits

The relief map was 10 feet wide by 50 feet long, the vertical scale being 1 to 5,000 and the horizontal scale 1 to 2,500. It showed the physical features of the Canal Zone, as well as the Cristobal and Balboa harbors, the Atlantic and Pacific ports, respectively, of the Canal, Gatun Locks, Gatun Dam, Gatun Lake, Gaillard Cut through the Continental Divide, Pedro Miguel Lock, Miraflores Lake and Miraflores Locks. Many other features are shown, including the cities of Panama and Colon in the Republic of Panama, and the various facilities for shipping, such as piers, dry docks, repair shops and coaling plants.

The photographs, size 20 1/2″ by 24 1/2″, consisted of 22 views of the Canal taken during its construction, showing the progress of the work until the Canal was completed. Ships in the locks and in Gaillard Cut were also shown. The wall maps and charts showed the organization of the Panama Canal and Panama Railroad Company, the trade routes that pass through the Canal, and the number of ships that have gone through each year since it was opened to traffic.

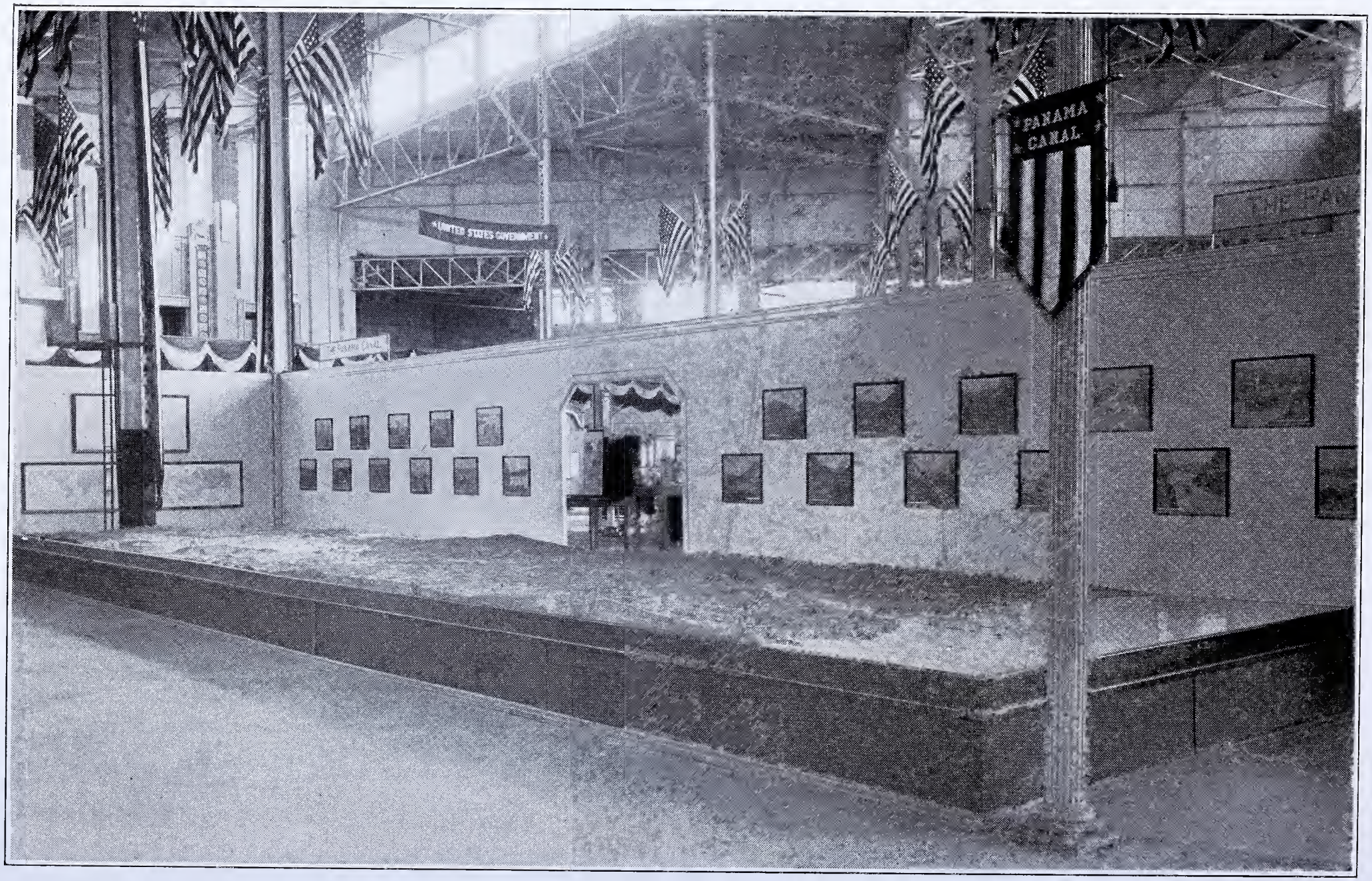

PLATE 287.—Exhibit of The Panama Canal.

THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

Foreword

Exhibits that relate to the activities of today—timely exhibits, because they are uppermost in the minds of the people at the present moment—have instant appeal. Such was the skillfully prepared and admirably maintained exhibit made by the National Advisory Committee for Aeronautics. It was a center of interest to old and young. Here one could turn the wheels himself, giving a visual demonstration of why flying machines fly. To nearly everyone it was a wonderful revelation to see how the control system of an airplane is operated.

The work of this Committee charged with the supervision and conduct of scientific researches in aeronautics, has led to many improvements and revolutionary changes in airplane construction. Definite knowledge of the stresses on an airplane in flight has been acquired; the actual distribution of air pressure over the surfaces of airplanes and airships has been made known, and the investigations carried on have resulted in many discoveries of inestimable value in the development of practical aviation.

Exhibits of
The National Advisory Committee for Aeronautics
at the
Sesquicentennial Exposition
1926

Introduction

The exhibit of the National Advisory Committee for Aeronautics was one of the features of the Government's exhibit at the Sesquicentennial International Exposition and proved to be one of the most popular with visitors. (Plate 288). Although it dealt with methods and apparatus used in the conduct of scientific research, this exhibit made an appeal to all classes, partly because of the widespread public interest in the subject of aeronautics, but more especially because fundamental principles of the new science of aerodynamics were presented and explained in such a way as to attract the interest of the public in general as well as of the scientist.

Organization and Functions of the Committee

The National Advisory Committee for Aeronautics is a Government establishment, created by Congress in 1915 to "supervise and direct the scientific study of the problems of flight, with a view to their practical solution, and to determine the problems which should be experimentally attacked, and to discuss their solution and their application to practical questions." The Committee was also authorized by the law to "direct and conduct research and experiments in aeronautics." The Committee is composed of twelve members appointed by the President, consisting of two members each from the War and Navy Departments, one each from the Smithsonian Institution, the Weather Bureau, and the Bureau of Standards, and five additional persons from private life "who shall be acquainted with the needs of aeronautical science, either civil or military, or skilled in aeronautical engineering or its allied sciences." The law further provides that the members of the Committee as such shall serve without compensation.

The officers of the Committee elected annually from its membership are a chairman, a secretary, and a chairman of the Executive Committee, and under their general control is a staff of paid employees numbering approximately 160.

Research programs are initiated by three major sub-committees, namely, Aerodynamics, Power Plants for Aircraft, and Materials for Aircraft. These subcommittees are organized along the line of the

PLATE 288.—General view of exhibit of the National Advisory Committee for Aeronautics.

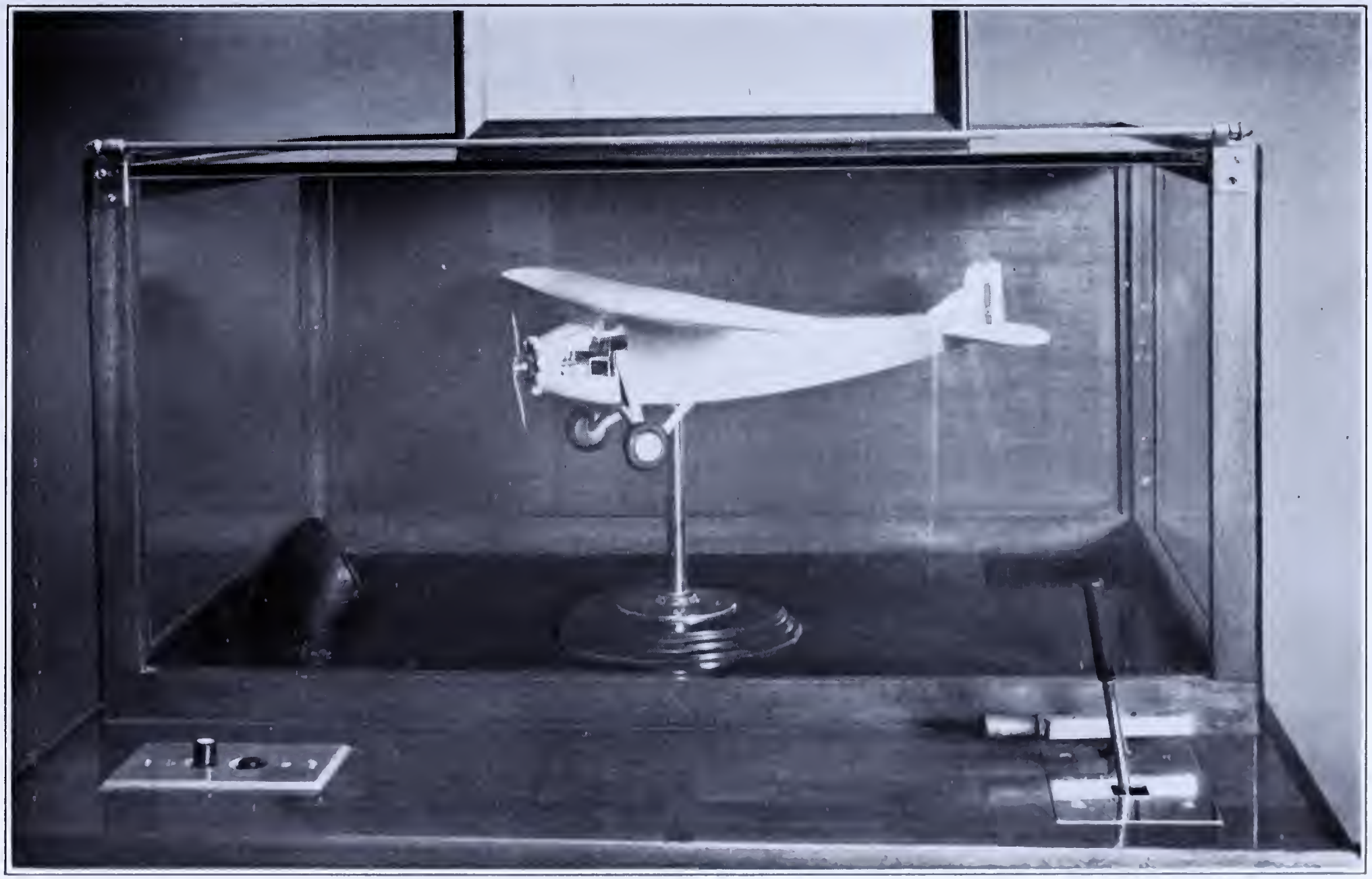

PLATE 289.—Working model demonstrating the control system of an airplane.

main Committee and are composed of officers of the Army and Navy air organizations in charge of various engineering developments in aeronautics, experts from other governmental agencies such as the Bureau of Standards, the Weather Bureau, and the Forest Products Laboratory, and persons appointed from private life. The members of the subcommittees serve also without compensation. In this way the talent of America is marshaled for the most effective continuous prosecution of scientific research in aeronautics and the services of men otherwise not available for Government service are enlisted in this work. The research programs recommended by the subcommittees indicate the Government laboratory, university, commercial firm, or individual best equipped to perform each stated investigation, and upon approval by the Executive Committee and allotment of funds where necessary, the work is begun. The more fundamental problems for the study of which facilities are not elsewhere available are referred to the Committee's own laboratory known as the Langley Memorial Aeronautical Laboratory, located at Langley Field, Virginia. Here the Committee has a group of seven buildings and a hangar, and a staff of employees numbering about 135, a portion of Langley Field having been set aside by the War Department for the use of the Committee and the buildings having been erected by the Committee under direct appropriations by the Congress. Under the Committee there is a Director of Aeronautical Research who coordinates all scientific investigations in aeronautics.

Description of the Exhibits

Control System of an Airplane

To many who had never been close to an airplane, and to others who had flown merely as passengers, it was a revelation to see how the control system of an airplane is operated. A working model which gave the visitor an opportunity himself to manipulate the "control stick" and the "rudder bar" seemed to hold a fascination for both old and young. This was a model monoplane with a radial air-cooled engine and was enclosed in a glass case. A current of air was constantly flowing past the wings and the propeller was always rotating. On the outside of the case were two handles which connected with the control stick and the rudder bar, and a cross section view of the cockpit showed what the pilot did as the visitor moved the handles, while at the same time the control surfaces of the airplane, namely, the ailerons, the elevator, and the rudder, which were plainly marked, responded to every movement of the controls. (Plate 289).

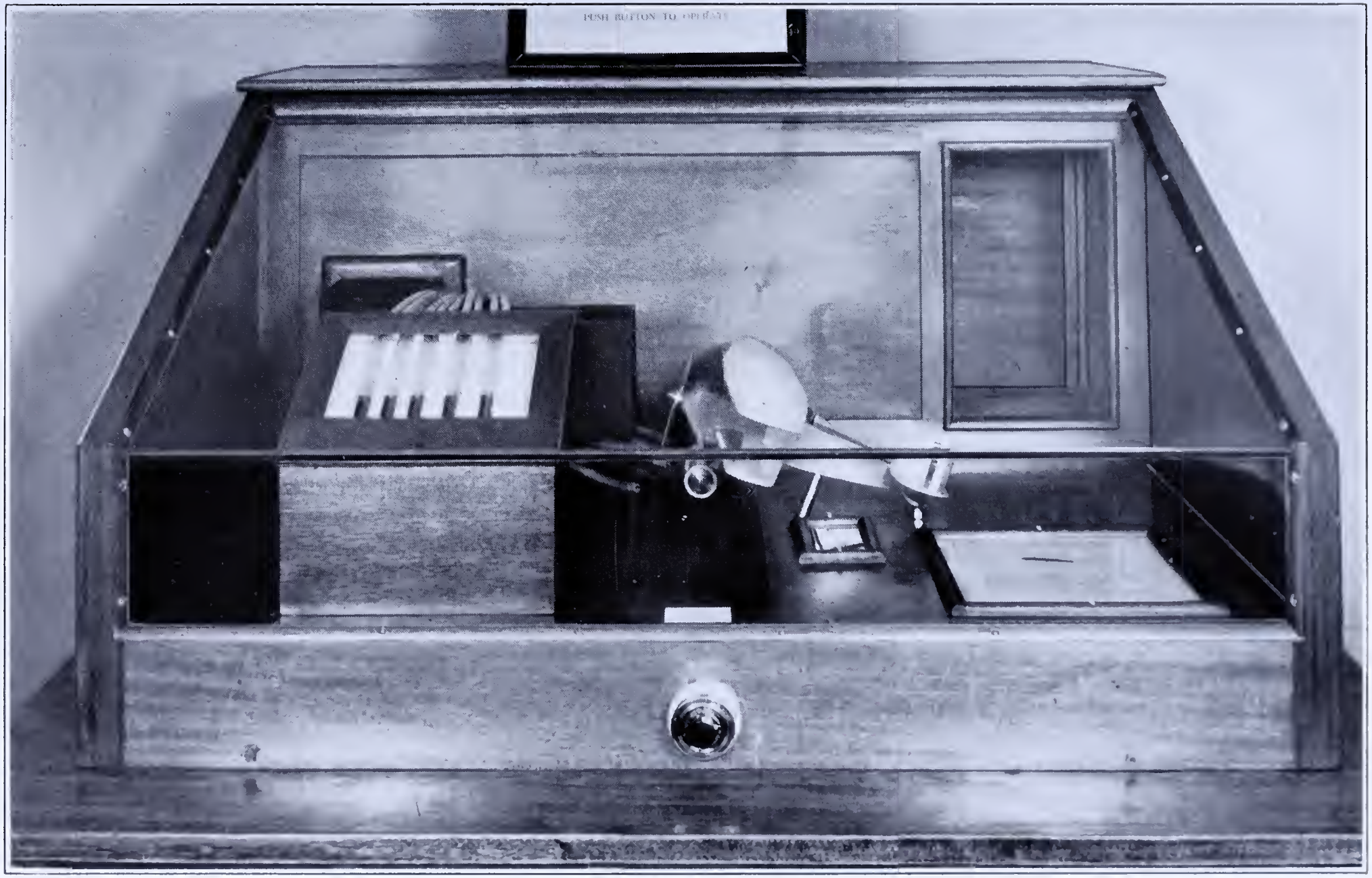

PLATE 290.—Working model demonstrating why an airplane flies.

Why an Airplane Flies

A working model demonstrating why an airplane flies showed that the flow of air past the wings of an airplane creates a suction lift on the upper surfaces of the wings, and a positive pressure upward on the under surfaces of the wings. It also indicated the variation of this lifting force along the line of flow of the air from front to rear of the wing. Along this line were five holes on the top surface of the wing and five on the under surface, connected by tubes to a manometer. When a visitor turned the switch a current of air was sent past the airplane model at high speed. The difference in the air pressure at each of the ten holes was instantly registered in the manometer, the fluid in the five tubes leading to the holes in the upper surface of the wing being sucked upward, and the fluid in the five tubes leading to the holes in the under surface being pressed downward. The magnitude of this suction or pressure varied with the location of each hole on the wing, thus showing how the air pressure or lift is distributed over the wings of an airplane in flight, and showing further that the major portion, approximately 60 per cent, of the weight of an airplane is sustained by a section on the upper surfaces of the wings. (Plate 290).

In the actual conduct of pressure distribution research there may be hundreds of such holes in the surfaces of an airplane, including its control surfaces, and a multiple manometer is used which automatically records continuously the variation in pressure over each hole in the surface while the aircraft is in steady flight or going through maneuvers. It is particularly important to know what are the stresses on the structure of an airplane when going through violent maneuvers such as a nose dive, reverse turn, loop-the-loop, etc. The United States was the first nation to devise a means of ascertaining this distribution of stresses on aircraft in flight. The knowledge derived has been of great value in improving the design, construction, and performance of airships and airplanes of all types and the results of such researches conducted by the committee have been used by all progressive nations in improving the design and construction of their aircraft.

Stresses on an Airplane in Flight

Two relief models were exhibited, showing the distribution of lift over the wings of a Thomas Morse airplane, in one case the airplane being in a vertical bank at a speed of 150 miles per hour and in the other case being in steady flight at a speed of 70 miles per hour.

The high speed tests, completed in 1923, gave startling results indicating a very uneven distribution of air pressure with a maximum lift on the front edge as high as 210 pounds per square foot, falling off abruptly and with sharp variations in pressure at the wing tips and along the

PLATE 291.—Exhibit showing distribution of air pressure over the hull and control surfaces of an airship in flight.

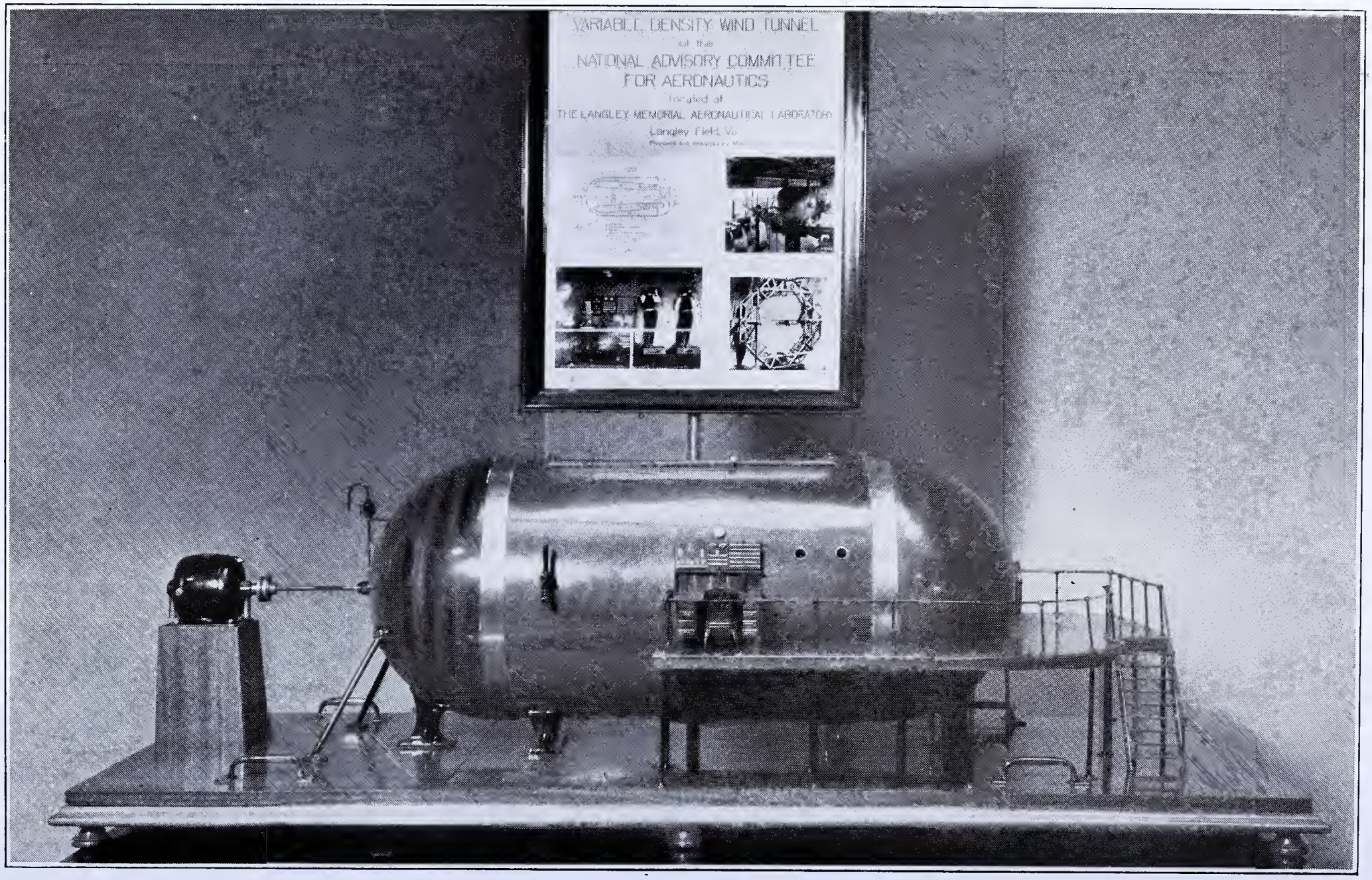

PLATE 292.—Working model of the variable density wind tunnel.

trailing edge of the wing. At the lower speed the magnitude of the forces was not so great but the results afforded an interesting study in the variation of pressure. This was the first time that definite knowledge had been obtained on the broad question of the stresses of an airplane in flight, and explained why the fabric on the upper surfaces of airplane wings had at times torn off in nose dives and why wings and control surfaces had broken off in flight, with fatal results. These investigations led to others and to revolutionary changes in the shape of airplane wings and in the location of the strength members.

Distribution of Air Pressure Over Airship Surfaces

A number of relief models were exhibited showing the distribution of air pressure over the hull and control surfaces of a nonrigid airship in flight. The methods used were substantially the same as those described above except that especially designed rubber pressure pads were affixed to the surfaces because it was found impracticable to make pressure holes in the airship fabric. Subsequently, similar tests were made on the rigid airship *Los Angeles*. This exhibit showed methods and results possessed by no other nation, which will prove of great value in the future design of airships of all types. (Plate 291).

The Variable Density Wind Tunnel

A working model of the variable density wind tunnel was distinctly a feature of the Committee's exhibit. (Plate 292). This piece of apparatus is unique in the world. It was designed by the Committee's experts in order to secure more accurate data than could be obtained from model tests of airplanes in ordinary wind tunnels. The exhibition model represented a steel tank 34 feet 6 inches long and 15 feet in diameter, without internal bracing, designed to operate with compressed air up to a pressure of 300 pounds per square inch, and weighing approximately 100 tons. Within this tank is constructed a wind tunnel of more or less conventional type in which the aerodynamic characteristics of airplanes are determined by model tests in an air stream with the air compressed in proportion to the ratio between the size of the airplane and the model. The interior of the exhibition model was lighted and an opening in the top afforded a view of what happened when the visitor pressed a button and started the air flowing past a tiny airplane model set in place in the air stream. This wind tunnel also operates with the air at partial vacuum to simulate conditions in the upper atmosphere.

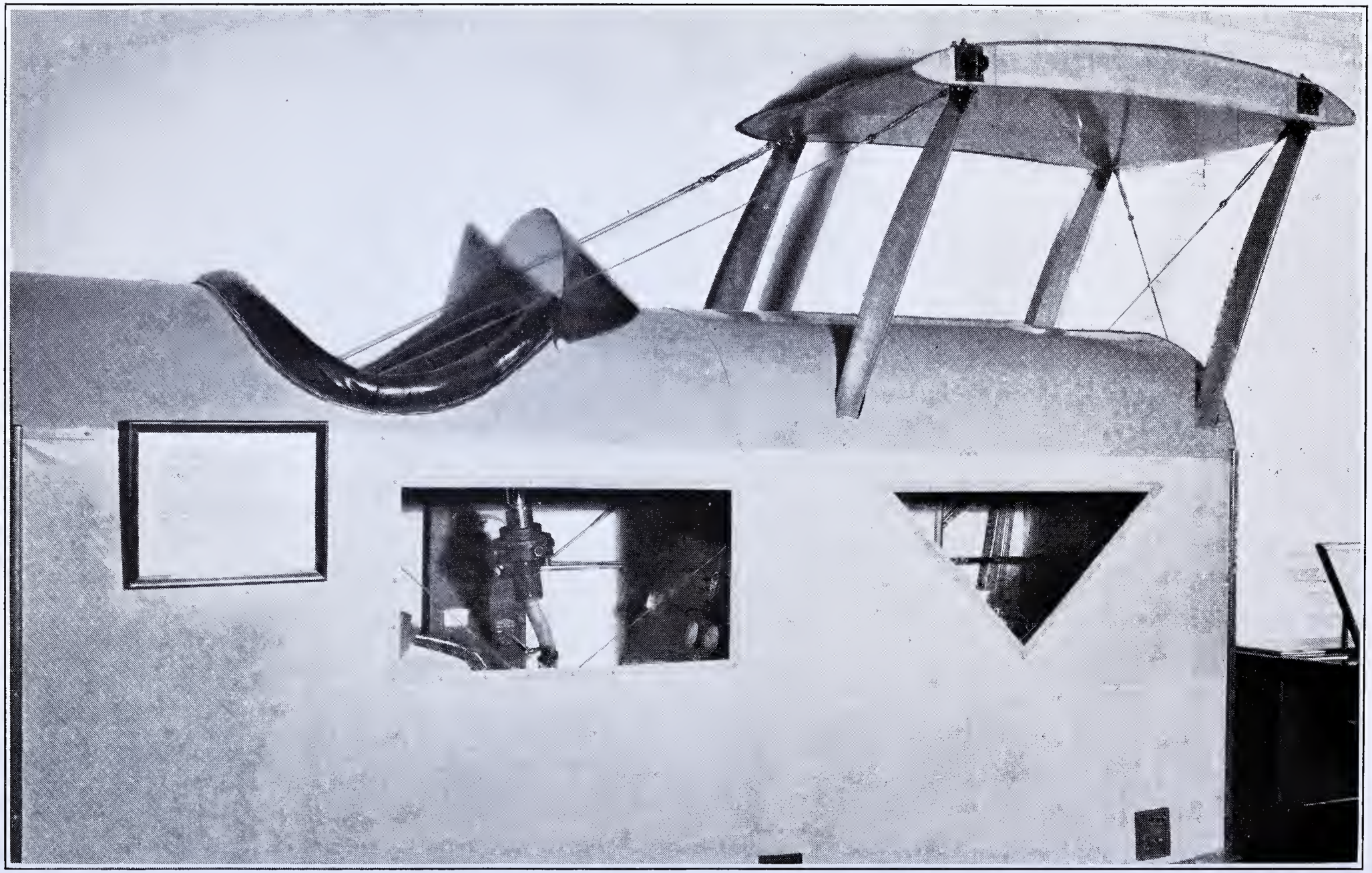

PLATE 293.—Portion of an airplane fuselage—showing the cockpit of an airplane specially equipped with instruments that measure and record the movement of the controls and the force exerted on the controls by the pilot.

The Principle of the Flettner Rotor Ship

A working model showing the principle of propulsion employed in the Flettner rotor ship attracted a great deal of attention. In this model a current of air flowed constantly past a vertical cylinder at rest. When the visitor pressed a button rotating the cylinder in a clock-wise direction the cylinder veered to the right in response to the cross wind force created by the rotation of the cylinder in the air stream. The rotation of the cylinder to the right caused the air to flow more rapidly, and consequently at less density or pressure, past the right of the cylinder than past the left. The difference in the rate of flow caused a difference in the pressure on the right and left of the cylinder, and it was this difference in air pressure that caused the cylinder to move at a right angle to the direction of the wind. By pressing the second button the cylinder was made to rotate in the opposite direction and accordingly veered to the left. The principle which this model demonstrated is known as the Magnus effect and has been studied experimentally by the Committee with a view to the possible improvement in the lift of an airplane wing by having a rotating cylinder at or near the front edge of the wing.

A Portion of an Airplane Fuselage

The Committee also had on exhibition a portion of a full-sized airplane fuselage showing the cockpit with control stick and rudder bar and equipped with research instruments especially developed by the Committee to measure the force exerted by the pilot in operating the controls. This shows how the control stick is equipped with a special instrument to record the force used by the pilot in moving the control stick. This force is indicated by two instruments on the dashboard, one of which registers the force when the control stick is pushed from side to side to move the ailerons which control banking and the other the force used in pushing the control stick back and forth to move the elevator which controls the angle of ascent or descent. A continuous record of the measurement of these forces is made by the control force recorder, one of the instruments in the compartment forward of the cockpit shown in (Plate 293). Other instruments shown in that compartment are the control position recorder, which gives a continuous record of the movement of the controls during a flight; an airspeed and altitude recorder and a turn recorder. From the records of these instruments valuable data can be plotted as to the flying characteristics of the airplane. This system of conducting research on an airplane in flight was devised by the Committee and the United States was the first nation in

PLATE 294.—Photographs showing the Langley Memorial Aeronautical Laboratory, Langley Field, Va.

the world to have a means of obtaining reliable knowledge of the flying characteristics of an airplane. From the records produced by this assembly of instruments, the stability, controlability, and maneuverability of an airplane can be studied and improved.

Other Exhibits

Other instruments were shown, including a flight-path-angle and airspeed-recorder, a small constant speed motor especially developed for use in automatically recording aeronautical research instruments, and recording accelerometer to determine accelerations in flying as well as in taking off and alighting. There was a panel containing four shapes varying from an ordinary wire to a model wing section. The panel was accompanied by the striking statement that the air resistance of each of the four shapes was the same, thus showing the value of streamlining all portions of an airplane exposed in the air stream, in order to decrease the drag or head resistance of an airplane. In addition, there was a photo-displayor, a series of wing frames shown in (Plate 294), with illustrations of equipment and methods used by the National Advisory Committee for Aeronautics in the conduct of scientific research on the fundamental problems of flight. The first leaf of the displayor showed Langley Field, Virginia, the site of the Langley Memorial Aeronautical Laboratory, where the research work of the Committee is performed under the immediate control of the Committee in accordance with appropriations made by Congress.

This photo-displayor presented photographs and charts showing interesting features of the Committee's work, including a Roots type supercharger and a fuel injection aircraft engine. An airplane engine develops its full power at sea level where the density of the air is 15 pounds per square inch. As the airplane climbs into higher altitude the density of the air decreases and the power of the engine falls off proportionately. The function of a supercharger is to compress the rarified air of the higher altitude to sea level density as far as possible. The effect of the use of a supercharger may be appreciated from a comparison of the performance of a given airplane with and without a supercharger. Without a supercharger the engine develops its full power, say 400 horsepower, at sea level. As it climbs its power falls off so that it is only able to reach a maximum altitude of 17,000 feet, at which it is developing only about 200 horsepower. With a supercharger it would develop its full 400 horsepower at 17,000 feet and would be able to climb much further, the maximum altitude being approximately 30,000 feet. The airplane speed is also increased by the use of the supercharger at high altitudes, as well as the rate of climb.

In addition, the Committee has demonstrated that the Roots type supercharger is adaptable to both water-cooled and air-cooled engines.

The fuel injection aircraft engine is a development of the Committee's laboratory. The purpose of this engine is to use fuel oil instead of gasoline, thus minimizing the possibility of danger of fire, and eliminating spark plugs, carburetor, and ignition system completely, and improving the reliability and economy of operation. Ordinary heavy Diesel oil engines operating at a speed of approximately 300 revolutions per minute have been successful in industrial establishments. The development of this type of engine for operation at speeds up to 2,500 revolutions per minute, and with the engine weighing approximately one-tenth to one-twentieth as much per horsepower for aircraft purposes, has involved years of scientific study and research.

THE NATIONAL COMMISSION OF FINE ARTS AND THE OFFICE OF PUBLIC BUILDINGS AND PUBLIC PARKS OF THE NATIONAL CAPITAL

THE NATIONAL COMMISSION OF FINE ARTS
AND THE
OFFICE OF PUBLIC BUILDINGS AND PUBLIC PARKS OF THE NATIONAL CAPITAL

Foreword

These two organizations are working together in the development of a "City Beautiful,"—maintaining its 560 City parks; perfecting the architectural designs of its public buildings, memorials and monuments; directing the execution of plans already under way, and evolving new elements that will enhance their beauty, so that all shall finally appear as a great and lovely picture, complete and harmonious in all its parts.

This is a task in which all Americans are interested. Everyone is justly proud of our Nation's Capital and those now charged with its aesthetic development have ever before them visions of a city that shall be called the most beautiful Capital in all the world.

Plans having this aim in view are being given able consideration and the display of these along with many charming pictures of outstanding interest and the remarkable model of the Capitol, added an important and altogether attractive feature to the Government exhibit.

Exhibits of
The National Commission of Fine Arts
at the
Sesquicentennial Exposition
1926

Introduction

The National Commission of Fine Arts exhibited a selected set of views, about fifty in number, illustrating both the work of the Commission, and also the development of the National Capital. (Plate 296). The exhibit consisted of groups of pictures pertaining to—

The L'Enfant Plan and Early Washington
The Park Commission Plan of 1901
Views of pending projects and the Future Washington
Views of proposed Public Buildings, Monuments and Memorials

The Constitution of the United States, adopted in Philadelphia on September 17, 1787, provides in Article I, Section 8, paragraph 17, that the Congress shall have power—

> "To exercise exclusive legislation in all cases whatsoever over such district (not exceeding ten miles square): as may, by cession of particular States and the acceptance of Congress, become the seat of Government of the United States, and to exercise like authority over all places purchased by the consent of the legislature of the State in which the same shall be, for the erection of forts, magazines, arsenals, drydocks, and other needful buildings."

The question of location of the National Capital of these United States forms one of the most interesting chapters in the history of this country, and the fact that the "Federal City" was located on the banks of a navigable stream, amidst a cluster of hills covered with beautiful trees, at the gateway to the South and near to many places of historic interest has contributed much to the beauty of Washington and the great interest taken in it. By virtue of the Constitution, Washington is the one city in the United States in which all citizens have a share.

It has taken more than a century for the American people to realize the vision of the "Fathers of the Constitution," who in those early days of the Republic planned for a great and beautiful Capital City of the Nation. A plan for the city was ultimately prepared in 1792 under the direction of George Washington, by Pierre Charles L'Enfant, a French engineer in the service of the Continental Army like Lafayette,

PLATE 296.—General view of the exhibit of the National Commission of Fine Arts.

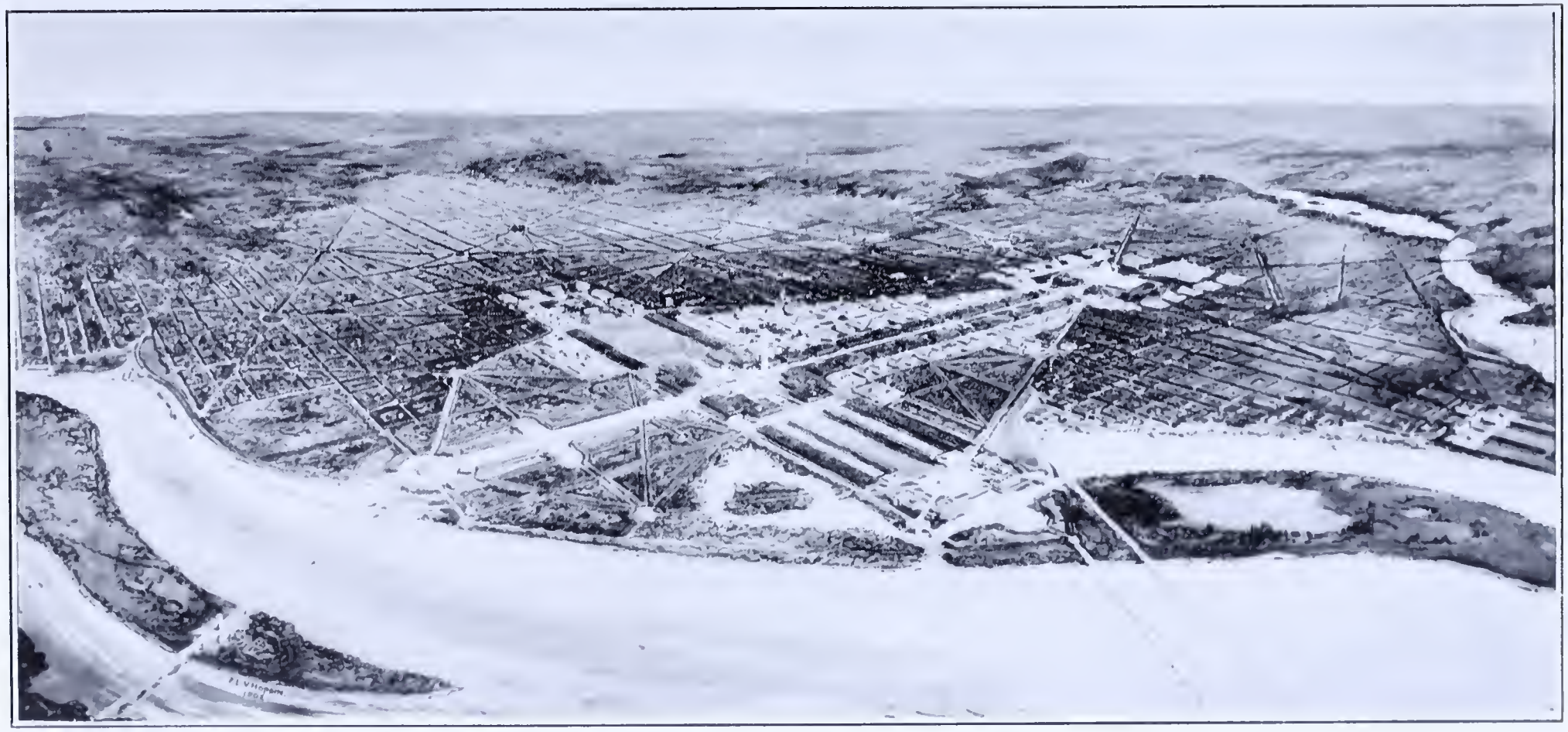

PLATE 297.—View of enlarged L'Enfant plan of the District of Columbia, made in 1901.

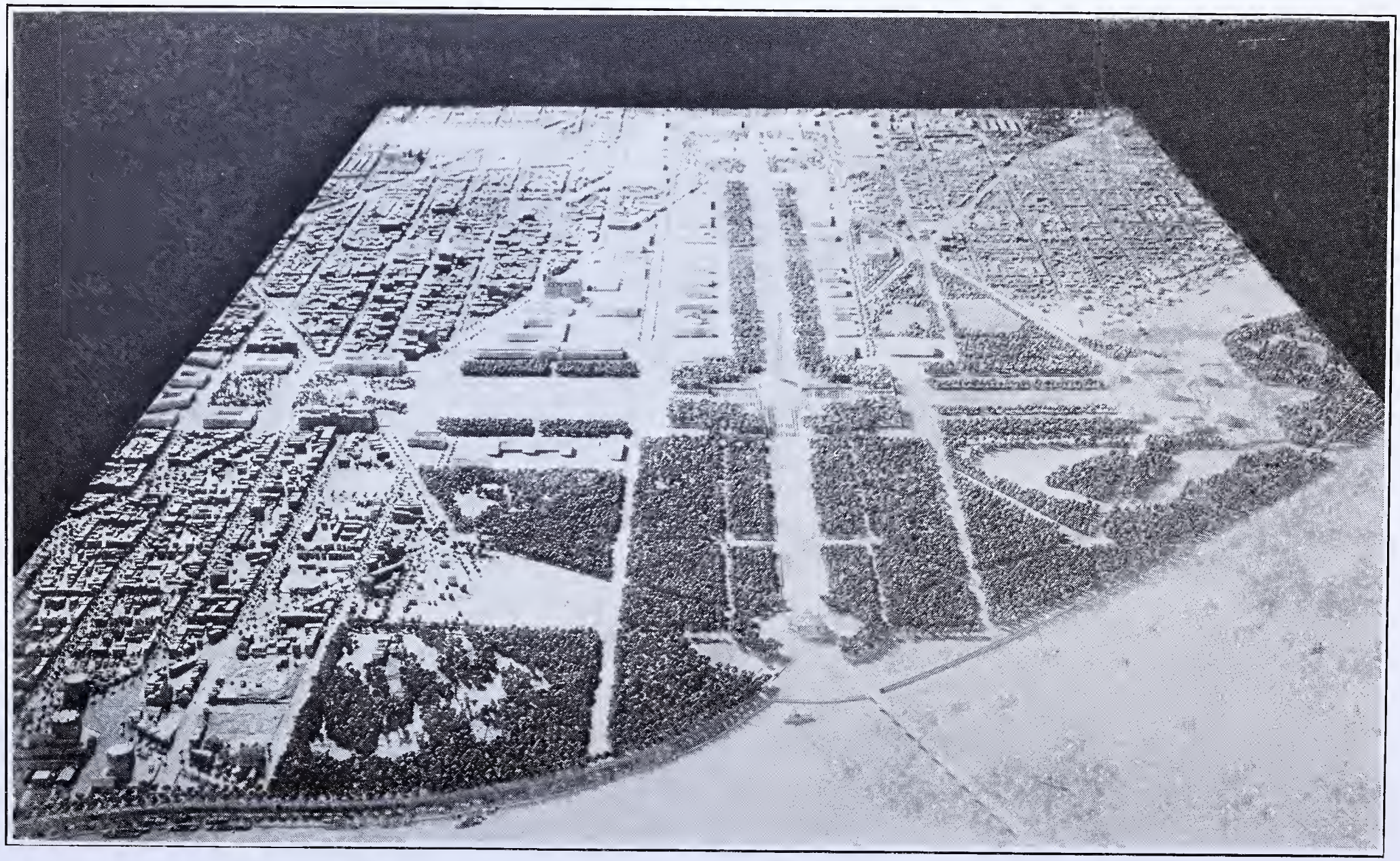

PLATE 298.—Model of central portion of the L'Enfant plan of 1901.

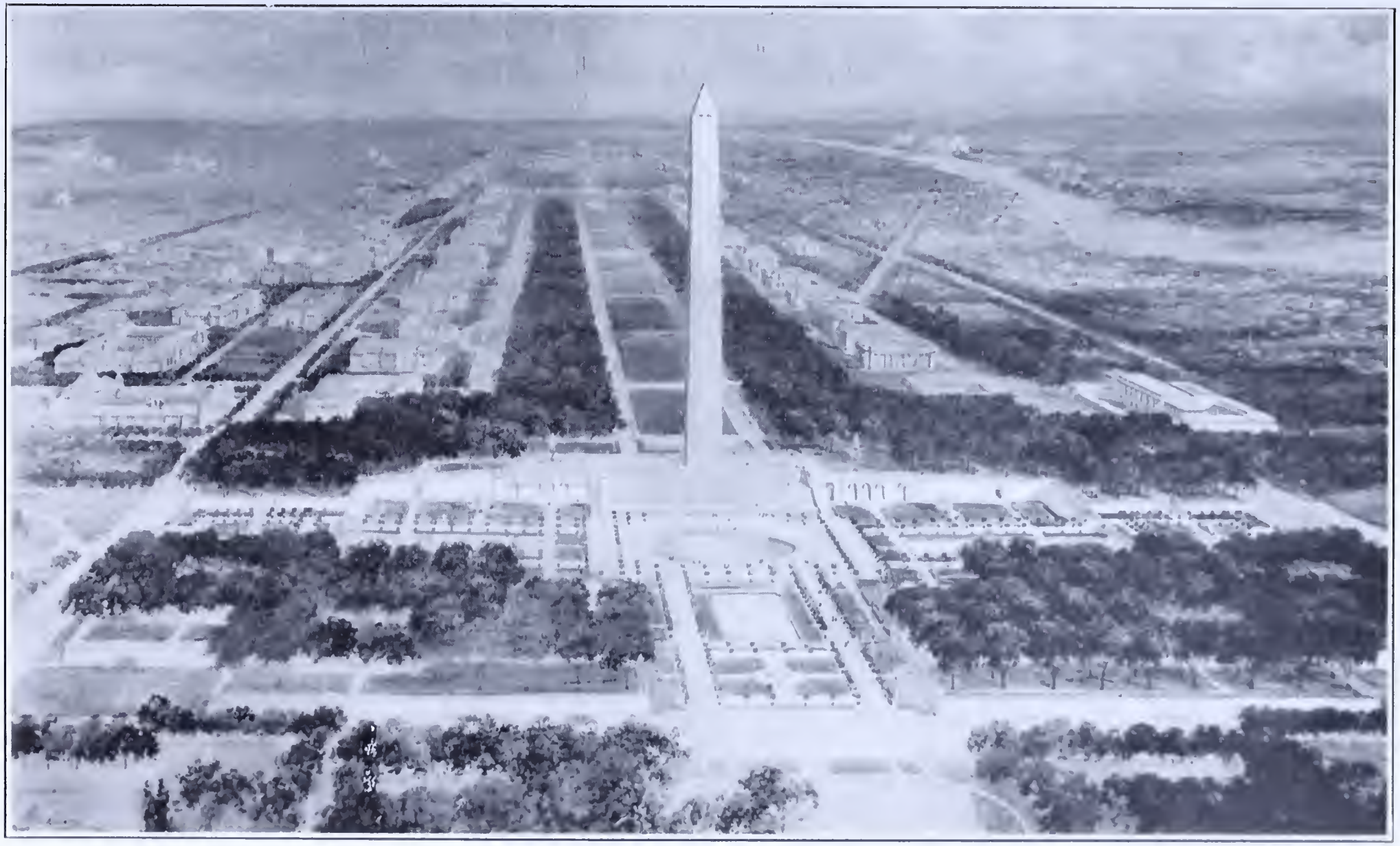

PLATE 299.—Photograph of model of the Plan of 1901, showing Mall and Monument Grounds.

PLATE 300.—The Lincoln Memorial.

and is called the L'Enfant Plan. It was the first comprehensive plan ever designed for a national capital, and is a masterpiece of monumental civic design. The plan had in view a city of 800,000, covering an area as large as Paris at the close of the eighteenth century.

Description of the Exhibits

The original L'Enfant Plan was enlarged in 1901 by the Park Commission so as to adapt it to the entire District of Columbia. The plan of 1901 was an outcome of the World's Columbian Exposition in Chicago in 1893. (Plate 297). The Plan of 1901 reasserted the authority of the original plan of L'Enfant, extended to meet the needs of the Nation after a century of growth in power, wealth, and dignity, and also marked the path for future development. (Plates 298 and 299). In 1910 Congress created the National Commission of Fine Arts, which undertook to see to it that improvements provided by Congress should be carried out according to the Plan of 1901. Mr. Burnham was appointed a member of the Commission and became its first Chairman. Substantially all the improvements in Washington during the past 25 years have been executed in accordance with the Plan of 1901. Among these are notably the Lincoln Memorial, (Plate 300) and the Arlington Memorial Bridge, which is now under construction.

The World War added to the population of Washington 80,000 people in six months' time. After war activities ceased, interest in the National Capital had grown to such an extent that there are now fully 100,000 more people than before the war, and today Washington, with a population somewhat over 500,000 ranks fourteenth among the cities of the United States. The problem of providing for the Greater Washington, with a population of 1,000,000 inhabitants having become urgent, the National Commission of Fine Arts, in 1922, recommended the establishment of a National Capital Park Commission, which was created by Congress in 1924, for the purpose of acquiring park areas within the District of Columbia, and in Virginia and Maryland in cooperation with authorities from those States. In 1926, Congress conferred additional authority upon that Commission by creating the National Capital Park and Planning Commission, which will plan in cooperation with this Commission for a great National Capital Park System.

The Sixty-ninth Congress, by act approved May 25, 1926, adopted a Public Buildings Program, authorizing an expenditure of $50,000,000 during the next five years for new buildings in Washington, to be located particularly in the area south of Pennsylvania Avenue, between the United States Capitol and the White House, a distance of one mile. This Commission exhibited at the Sesquicentennial Exposition a number of views of proposed buildings planned for that area.

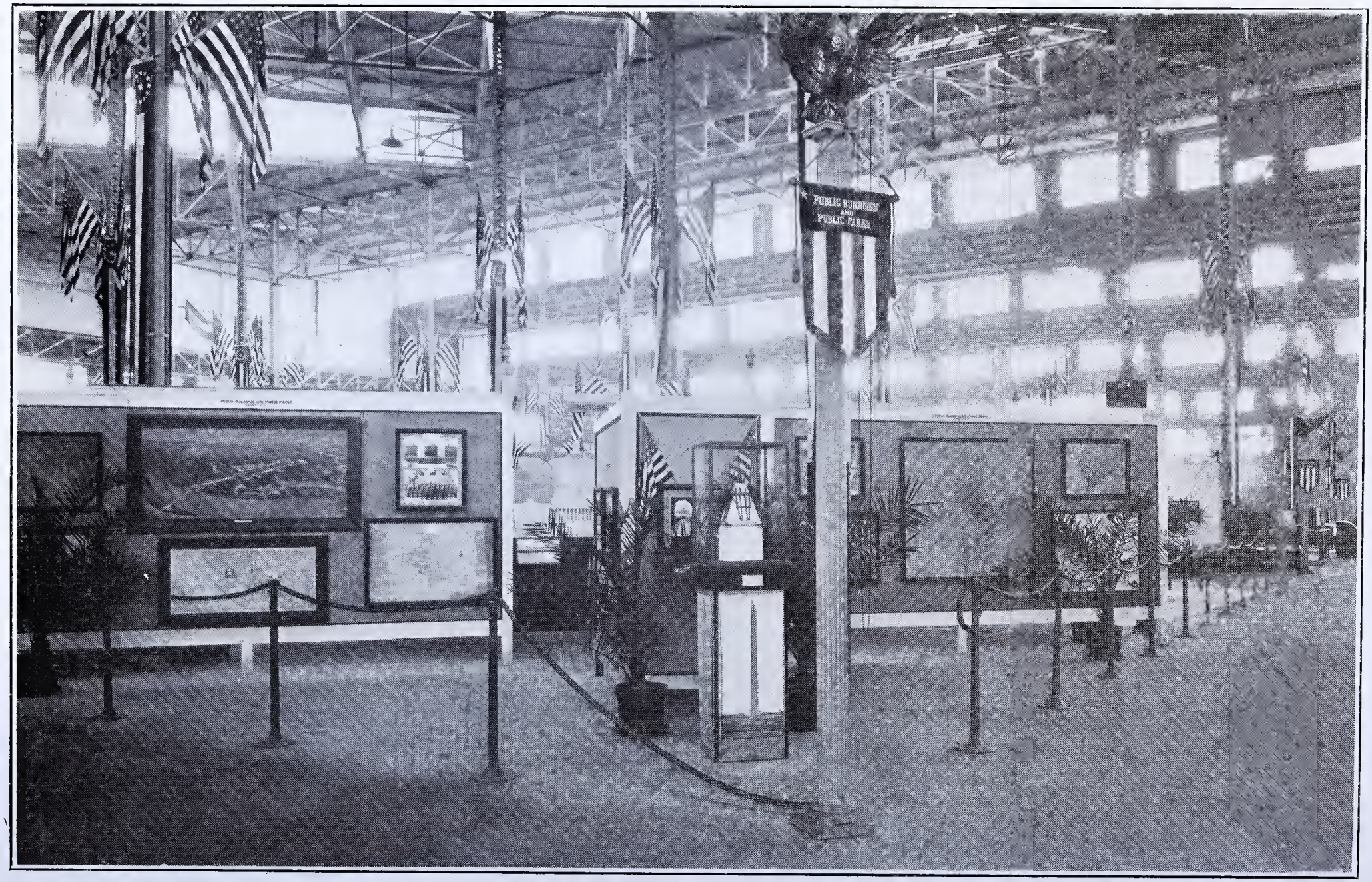

PLATE 301.—Exhibit of Office of Public Buildings and Public Parks of the National Capital.

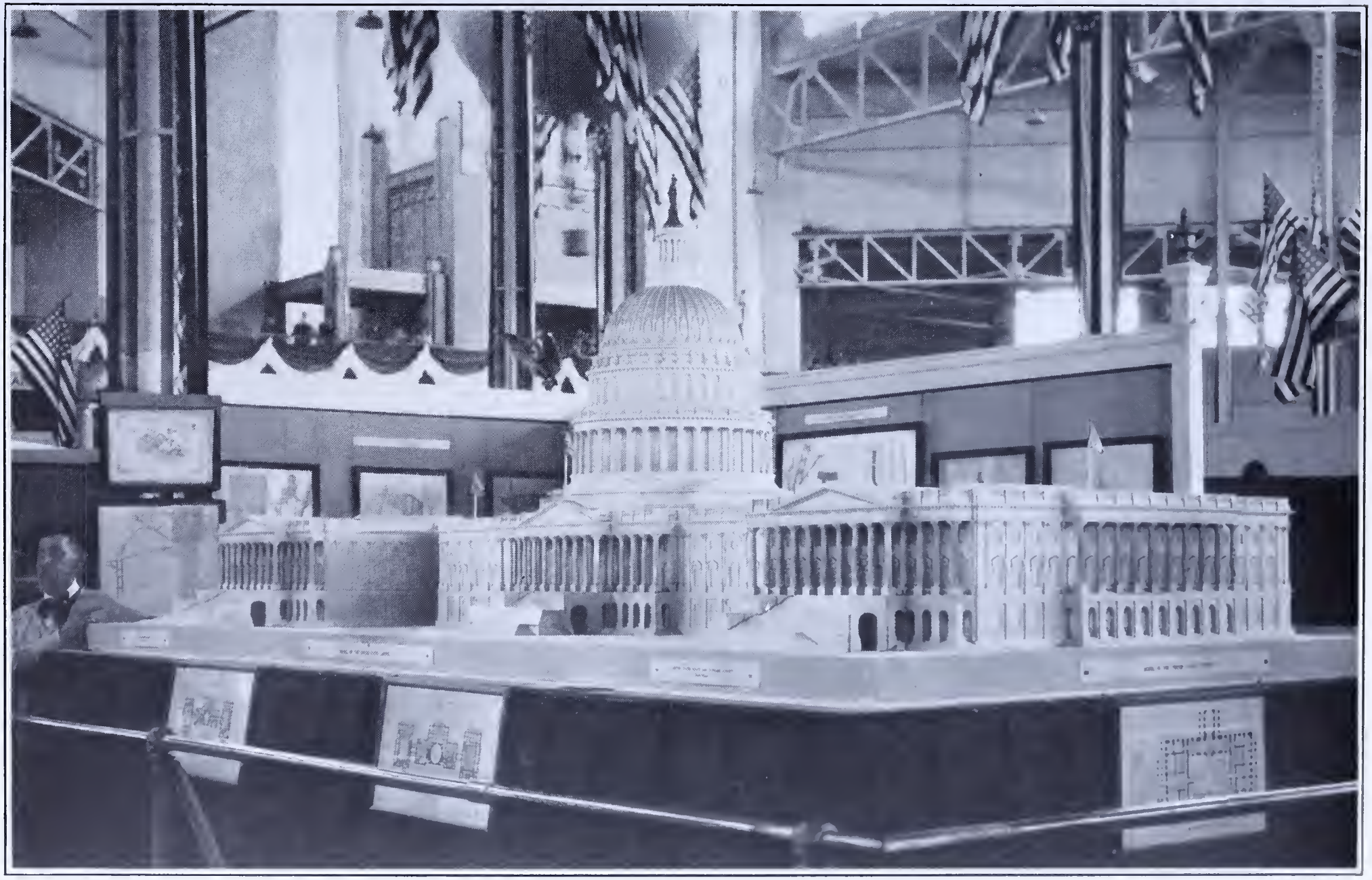

PLATE 302.—Model of the Capitol in the Public Buildings and Parks exhibit.

Among the views were also a number of great monuments and memorials erected by authority of Congress under the supervision and with the advice of the National Commission of Fine Arts, among them the Grant Memorial, the Butt-Millet Memorial Fountain, the First Division, A. E. F., Memorial.

The views exhibited were of historical interest from the fact that in 1932 will be celebrated the bicentennial of the Birthday of George Washington. Plans for this celebration are in the hands of a special commission created by Congress. It is expected that several of the still unfinished projects of the original L'Enfant Plan will be completed by that time, and also the new public buildings. Washington will then have become in reality the "City Beautiful."

PLATE 303.—View of the U. S. Government Exhibits from balcony looking west.

PLATE 304.—Photographs of monuments, plans, etc., in the Public Buildings and Parks exhibit.

Exhibits of the Office of Public Buildings and Public Parks of the National Capital at the Sesquicentennial Exposition 1926

Introduction

This exhibit illustrates many of the beauties of our National Capital and therefore should possess special interest to all American citizens. (Plate 301).

The many maps and photographs in the exhibit depict the parks of the National Capital, some 560, with a total area of 3,368.21 acres, and together show the avenues, public buildings, statues, bridges, and many historic places in the old Federal city, within the boundary of the District of Columbia. Special interest attaches to the series of historical photographs of the White House illustrating development of the plan of the National Capital from that proposed in 1791, by Major L'Enfant and approved by President Washington.

Description of the Exhibits

The models of Meridian Hill Park, East Potomac Park and the Washington Monument, were self-explanatory, and illustrated special projects of the greatest interest.

The model of the Capitol, (Plate 302), on a scale of 1/5 inch to the foot, is a work of art. The many details of the columns, capitals, cornices, windows, and dome, were carefully cast and so carved as to represent the originals with unusual precision.

The drawings displayed on the four side walls surrounding the Capitol model were some of the originals used by Mr. Walters and Mr. Clark, architects of the Capitol extension, in the construction of the dome and the wings of the building. This is the first time that these drawings have been exhibited to the public.

The space assigned the exhibits was triangular in shape and contained about 2,700 square feet. It was enclosed by a manila rope supported by iron standards, with three entrances.

A rectangular room about 42 feet by 30 feet was constructed within the triangle with four entrances, one in the middle of each side. (Plate 303).

The walls of this room were nine feet high and were set 12 inches up from the concrete floor and comprised eight panels, constructed of upson board on wood framing.

Some fifty-three glazed and framed drawings of the Capitol were hung on the inside walls.

The model of the Capitol rested on a wooden platform, 7 feet by 13 feet and 48 inches high from the floor. This platform was draped with a rich old gold fabric which added much to the beauty and general appearance of the exhibit, and was also surrounded by a brass rail.

Upon the outside of the walls of this rectangle and in the corresponding panels were many framed maps, photographs, etc., from the office of Public Buildings and Public Parks. (Plate 304). The three small models under glass were placed in the apexes of the triangle near the entrances through the rope from the main corridors.

Two circular discs, (enlarged photographs) about 12 inches in diameter, with two flags were displayed over each entrance to the inner chamber. The four on the outside represented the office of Public Buildings and Public Parks, and the four others on the inside represented the office of the Architect of the Capitol.

Strehlow

WITHDRAWN